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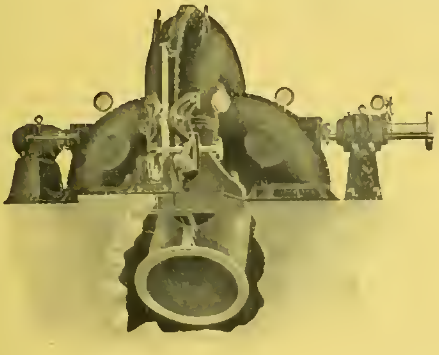
Vol. XIX Toronto, January, 1910 No. 1

Canadian Electrical News & Engineering Journal

DEC 3 1909

FRANCIS TURBINES



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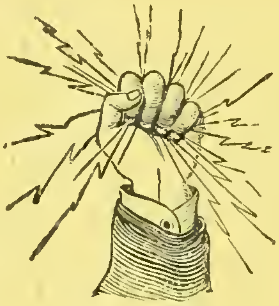

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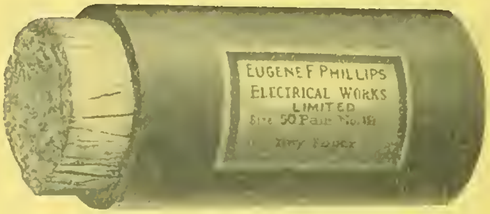

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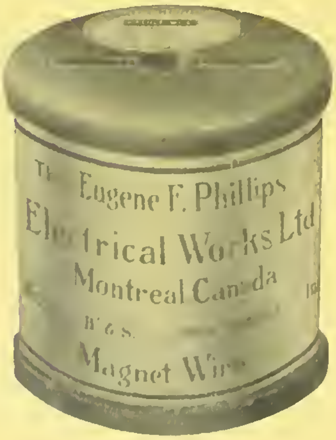

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EDITOR'S ANNOUNCEMENT.

Correspondence is invited upon all topics coming legitimately within the scope of this journal.

Vol. 19 Toronto, January, 1910 No. 1

A Happy and Prosperous New Year

The wish is father to the thought. In the realm of electrical matters advancement and prosperity are in the air. Not possibly, to any painful extent, financial advancement, but the advancement of new discoveries, more perfect methods, more spontaneous results. In no other profession can it be said, we believe, that such progress has been made in the past decade, or the past year. And there is yet so much to discover, so many things to perfect, so little chance of reaching any limit in the absorbing study of electricity that the next year must be one of prosperity and happiness—happiness born of absorbing work. May the readers of the "Electrical News," and all those who work in electricity, receive their full share of whatever happiness or prosperity the new year may provide.

The Appeal to Caesar

A few weeks ago the question of disallowing the acts of the Ontario Government respecting the Hydro-Electric Power Commission was urged before the Dominion Government by eminent counsel, who argued that the acts of the Ontario Government were illegal and on purely technical grounds should be voided. Later, on Nov. 24, a deputation of prominent citizens from a number of western cities travelled to the capital to represent to the Premier that, in their opinion, the legislation was illegal and arbitrary, and not in the interests of the public as a whole. It was pointed out among other things that capital investment from abroad had been unfairly treated and the opinion was expressed that if the people of Ontario had complete knowledge of the facts a majority would demand a repeal of the Act. Still more recently, a capitalist from the United States, representing an investment of $5,000,000 in the bonds of one of the companies likely to be injuriously affected by Government competition, has protested to the Government against the pasage of an Act which may endanger the value of these securities. To one and all the answer is the same—the matter is under consideration.

No one who understands the sterling character of Canada's Premier believes for one moment otherwise than that the question of disallowance will receive the most searching consideration. There is no one but believes Sir Wilfrid's influence will always be used on the side of justice and reason. But on the other hand, there is that powerful factor, the exigencies of party government, before which past history has so often seen the strongest characters and the clearest arguments forced to give way. If only those citizens of London and Hamilton and Galt could convince the Premier of Canada that, with a true knowledge of the situation, the majority of the people would demand the repeal of the Act—but they can offer no such assurance.

As a matter of fact, this question has been pretty freely and widely discussed throughout our Dominion. There is very little chance that any voter, with sufficient intelligence to ever understand the situation, does not now understand it thoroughly. There are very few voters, we believe, who do not recognize to a considerable degree, all that the various deputations have claimed—that the legality of the Act is questionable (i.e., if a government can do an illegal act), that the Act itself is more or less arbitrary, that the value of securities of the competing companies likely will deteriorate or have already deteriorated, that foreign capital will look with suspicion at Canadian offerings where there is the slightest possibility that a government may interfere, and that, last, a certain injustice is being done to the very men who by their pioneer work have made the competition possible.

The whole question resolves itself into one of pure selfishness. Of course financiers years ago developed these industries because they saw in their development a chance of financial gain—it was from no philanthropic enthusiasm for the national good—and now the tables are turned and the people will follow relentlessly the same course of serving their own interests—if the laws of the land allow them.

There is this vast difference, however, between the two cases. The selfishness of a nation builder has inseparably associated with it the whole nation's advancement—in proportion as any man becomes great or influential his country shares his greatness. It does not appear that the same argument can be advanced for satisfying the selfish ends of labor—it means slower development, conservative and old fashioned methods, discouragement of genius in business, suppression of anything above a certain average. It is possible a government is ill-advised that allows itself, for any consideration, to be ruled by the selfish whims of any section of the electorate which in their satisfaction can give no guarantee of either immediate or ultimate advantage to Canada as a nation.

Depreciation of Municipal Systems

A dispute over the question of proper telephone rates which recently arose in the town of Marinette in Wisconsin, led to a thorough investigation by the Railroad Commission of that State, into the question of depreciation as it affected the various elements of a telephone system. The collected data, gathered from engineers connected with both Bell and Independent companies, fixed 12 years as the dependable life of wooden poles, 10 years as the life of iron wires, 12 years for aerial cable, 8 years for power plant, 8 years for storage batteries.. The average composite life of a plant was placed at 11.13 years. Further than this, it was stated that owing to such items as unforeseen changes in the state of the art, increase in traffic, which outgrew the equipment and necessitated the replacement with larger and more adequate apparatus, practically no piece of machinery lived its natural life. From this point of view an average life of 11.10 years would be somewhat too liberal an estimate. At this figure, however, an annual depreciation allowance of 8.98 per cent. per annum, or estimating an earning capacity of 4 per cent., 7.32 per cent. per annum would be an absolute necessity.

This, of course, is not news to the shrewd enterprising business man, whose income depends not only this year but ten and twenty years hence on the stability of the earning capacity of his system. The annual statement of any successfully managed private enterprise bears witness to the recognized need for frequent renewals by the prominent position of such items as renewal fund, depreciation account, reserve, surplus, etc., which constitute the basis, too, upon which experienced investors form their conclusions as to the value of any given stock.

To how few municipal undertakings, however, can this same remark be applied. We are met, it is true, with frequent declarations of interest disbursements, often a few months or a year after organization, with glowing reports of progress, and with greatest optimism on future successes, but that optimism, observe, is on the part mostly of those men who prepare the report and who are no doubt often honestly deceived by the immediate progress they have made and who, lacking experience of the kind required for this particular enterprise, do not yet see the pitfalls looming up in the future.

A much greater evil, however, results where a management exists, as we have many proofs they do exist, with the avowed object of getting immediate and favorable results at no matter what expense to the future consumer. It may be granted that the constituency of a municipal undertaking, shareholders and consumers alike, are much less schooled in the virtue of patience than the shareholders of a private corporation. The latter are, for the most part, investors in the real sense who recognize the need of a foundation for every kind of superstructure; the former are, more often, of a Socialistic turn of mind, who clamor for something to-day lest somebody else may get it to-morrow.

Herein, we believe, lies the greatest weakness of municipally managed enterprises. The municipal idea in Canada is too young yet to be able to point to established results as its justification—nobody has any right to look for such. But what we have a right to look for, and not only that, but what must actually appear, are indications of the upbuilding of the various enterprises along lines which commend themselves to men of experience in business and financial matters, to men who have proven the value of their opinions by their own successes. This point, we submit, has not yet been sufficiently considered, in general, by those who control municipal enterprises and on the recognition of its value will, we believe, depend largely the future success of this form of our country's development.

A Tender Question

The question referred to in this title, let me say at once, is the question of tenders—whether or not to call for tenders, whether or not to accept tenders, whether or not to submit tenders, and last but by no means least, how long a time tenders, if called for at all, should be left open.

That this question of tenders is indeed a tender question was realized with more than usual force by the writer some few days ago. An irate engineer lodged the complaint that a certain corporation not 1,000 miles from Toronto, had purchased certain materials without calling for the usual tenders. We also became indignant and approaching the said corporation made accusation as per our previous information. What was our surprise to be met by an emphatic denial in words that were both loud and awful. Further inquiry elicited the admission on the part of the irate one (the irate engineer we mean) that his accusation was made on no better foundation than scraps of one end of a telephone conversation which he had overheard. The reader will understand that now for at least three persons the question of tenders is properly labelled as above.

This matter of tenders, however, can be carried to ridiculous lengths. A few days since the writer was in the office of an engineer who has charge of large expenditures for electrical supplies, and in conversation learned that they were in need of a small quantity of wooden pins for a certain work, to obtain which the plan was followed, not simply of advertising, but, in addition, of writing personal letters to every firm that could by any chance be in a position to submit an estimate for the supply of this material. Another case that came to our notice some time ago was where tenders were called for the supply of certain horses for municipal work. Can anyone who has ever seen two horses side by side, and seen the impossibility of judging horseflesh by any single standard, imagine anything more impossible? And what is true of horse power may be, almost in the same degree, true of various other kinds of power apparatus. So many factors must be considered—the quality, the guarantee, the reputation of the manufacturer, the special adaptability of certain types of machinery for certain work, ets., that really the matter if price often is elemental in its influence and the plan of accepting the lowest tender is both unbusinesslike and dishonest.

But on the question of time we believe there is no room for dispute and much room for improvement. A case came under our notice recently where after getting an engineer's estimate on the cost of a certain piece if work, a corporation advertised—widely, fully, and long—with the result that the actual cost was in the neighborhood of 30 per cent. of the estimate. We choose to interpret this as the result of the wide publicity given the matter, and the inference is clear—(a) a corporation will benefit itself by getting a greater variety to chose from; (b) manufacturers and supply men over a much larger area will be benefitted and interested; (c) the greater competition will of necessity tend to lower prices. We contend that the practice of leaving tenders open for from 3 to 15 days, which is the usual custom, is quite inadequate for the best results and admits of no defence where a cimpany or corporation is honestly desirous of obtaining all possible information before purchasing. A short time tesder is little better than no call at all and simply supplies purchasers with a weapon of defence with which to meet the unsuccessful bidder.

Extensive Use of Aluminium Wire

The recent large order, involving nearly a half million dollars, placed by the McGuigan Construction Company for aluminum wire to be used on the Hydro-Electric transmission lines, impresses once more the rapidly increasing use of this metal as compared with a few years ago. One of the first companies to try the experiment was the Shawinigan Water & Power Company, where the two 50,000 volt transmission lines from the generating station to Montreal, now in use for several years, demonstrate better, probably, than any other installation in Canada, the satisfactory service this metal can be depended on to give. This first installation was, however, rapidly followed by others, until now a large number of the important transmission systems, both high and low voltage, use aluminum wire. Among the present users may be mentioned, in addition to those already noted, the cities of Guelph, Calgary (two companies), and Nelson; the municipal electric plant at Point du Bois, for Winnipeg, will use it; the Seymour Power Company, of Campbellford, recently installed it; the Montreal Street Railway has a 66-mile aluminum line supplying its suburban road; the Dominion Power & Transmission Company uses aluminum in part; the B. C. Electric Railway are using it on their extension to Chilliwack; the Welland Canal distribution uses six aluminum wires 27 miles in length, and last, the city of Toronto will distribute power with aluminum cable.

The advantages to be gained appear to be fairly clear cut, though in amount they are not large enough to be at all startling. It is claimed that the cost of aluminum is from 10 to 15 per cent. less than the cost of copper for cable of equal conductivity; that the weight of the silvery metal is only 48 per cent. that of copper. It is also claimed that the strain on the aluminum cable due to the combined forces of wind and weight is much less than on copper cable of the same conductivity, and that the difference becomes even more marked with larger diameters.

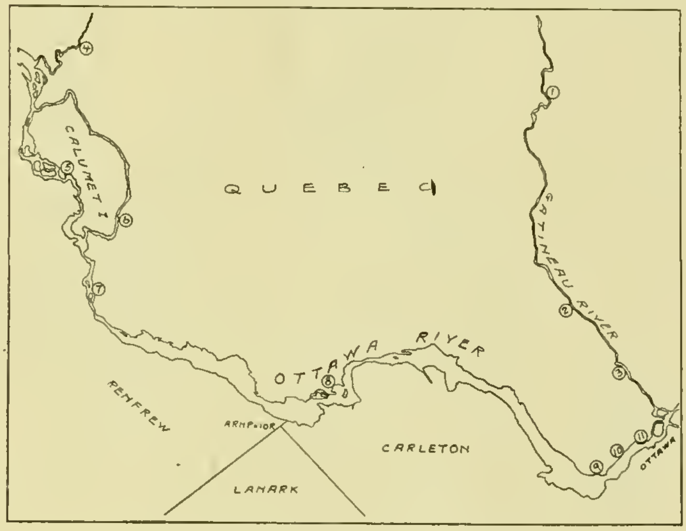
It is further claimed for aluminum that sleet will not adhere to it, and while this has not been proven beyond a doubt—indeed one meets an occasional engineer who claims to have seen ice and sleet adhering to aluminum—it does seem to be an established fact that it adheres less to aluminum than to copper.

A difficulty that has not yet been successfully met is found in the fact that aluminum wire cannot be soldered in the usual way. It can, however, be fused at a comparatively low temperature, 1120 degrees F., and with large cables contacts are now made by fusing the two ends at that temperature.

Water Powers on the Ottawa and Gatineau

The Department of Mines has just issued a report on the iron ore deposits, which are extensive, along the Ottawa river (Quebec side) and its tributary, the Gatineau. The entire absence of coal in this region has naturally suggested the utilization of water power for the development of the iron industry, the presence of which power now seems especially fortunate in view of the growing possibilities of smelting iron ores by electricity. In this connection a detailed account is also given, in the report, of the water powers in this same district, a summary of which, with a map showing the location of each group of falls, is given below.

It is pointed out that, while some few of the water powers did not appeal to the writer as offering special facilities for cheap development, there are, however, many points, representing by far the larger percentage of the power, where modern engineering skill would have little difficutty in overcoming the natural obstacles and establishing thoroughly satisfactory power plants.



Map Showing Location of Water Falls.

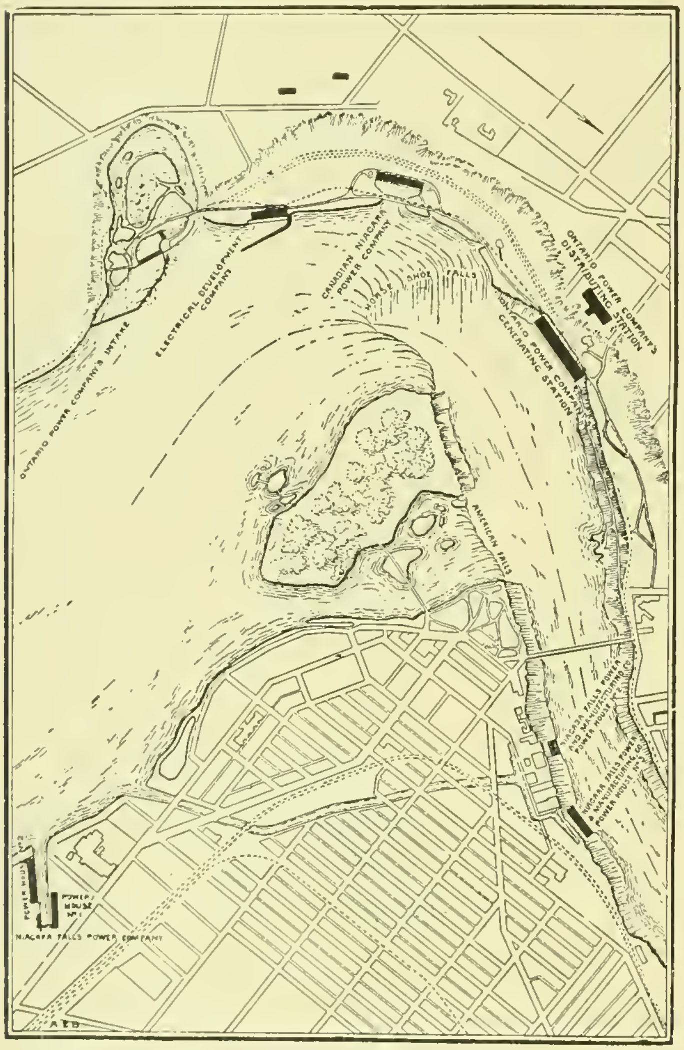
The table appended is also to be understood as representing not the total power available, but the minimum of power at the lowest head; in many cases the average power would be twice the amount given and the maximum in some cases three or more times the figures in the tables.

Water Powers

Ref. Nos.		h.p.
1	Paugan Falls	73,500
2	The Cascades	10,000
3	Chelsea Rapids	115,000
4	Great Falls, Coulonge river	24,000
5	Roche Fendue Channel	35,500
6	Calumet Falls	25,000
7	Portage du Fort Rapids	17,900
8	Chats Falls	50,000
9	Deschenes Rapids	35,000
10	Remic Rapids	25,000
11	Chaudiere Falls	70,500
	Beyond limits of map:	
	Black River Falls, west on Ottawa River	21,000
	Six Portage Rapids, north on Gatineau River	17,750
	Total	520,150

Power Development at Niagara Falls

Professor R. W. Angus presented a most interesting paper before the Canadian Institute on Dec. 4th, dealing with the power possibilities and present development at Niagara Falls.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ONTARIO POWER COMPANY GENERATING STATION
AMERICAN FALLS
NIAGARA FALLS POWER AND MANUFACTURING CO. POWER HOUSE No 2
NIAGARA FALLS POWER & MANUFACTURING CO. POWER HOUSE No 3
POWER HOUSE
POWER HOUSE No 1
NIAGARA FALLS POWER COMPANY
A.E.B.

Niagara Falls—Location of Power Developments.

The total fall between Lake Erie and Lake Ontario is 326 feet. This is made up mainly as follows: Buffalo to Chippewa, 14 feet; Chippewa to crest of falls, 55 feet; Niagara Falls, 158 feet; cantilever bridge to Lewiston, 95 feet. On the supposition that the entire head of 326 feet can be utilized the total development is placed at about 5,000,000 h.p. The falls alone represent about one-half of this amount, or 2,500,000 h.p. Charters have been granted for the use of 705,000 h.p., which is taken, for the most part, from just above the main falls and discharged just below them. The first charter was granted in 1879 to the Hydraulic Power & Manufacturing Company, but little or none has been developed for sale. Of the remaining developments, the Canadian Niagara Power Company, organized in 1892, together with the Niagara Falls Power Company (1894), have charters for 300,000 h.p.; these two companies are controlled by the same group of financiers. The Ontario Power Company, which will supply the Ontario Government with power for distribution to the municipalities, has charter rights up to 180,000 h.p., and the Electrical Development Company (1903), can develope 125,000 h.p.

The falls recede, on the average, about 4½ feet a year, though in recent years the amount is rather less than formerly

The paper was splendidly illustrated with some 80 lantern slides, the greatest attention being given to the Ontario Power Company's system, as being the largest in the world and as possessing more features of typical interest. The other plans were reviewed also with reference thereto.

An interesting feature of the discussion which followed was a short description by Engineer Fox, who has spent some years in South Africa, of the possibilities of development in the Zambesi district. He described the Victoria Falls as having a head of 420 feet and a capacity of well up to half a million horse power. A scheme is on foot to develop this power and transmit it to Johannesburg for use in the mines there. The distance, however, 600 miles, has so far proven the insurmountable difficulty. It is proposed to develop some 6,000 h.p. immediately, as an experiment, for local consumption. Turbines of the impulse type will be used on account of the greater head of water.

The Toronto Section A.I.E.E.

The meeting held, on Dec. 17th, in the Engineers' Club rooms, King street west, not only excelled in numbers any previous sittings, but contained, in some unexplainable way, something more than usual of the personal equation due to the wonderful personality of the speaker of the evening. Whatever can be said, politically or otherwise, of the project over which Mr. Sothman is the presiding genius, it certainly must be admitted that the Government showed peculiar wisdom in the choice of its chief engineer, and that if any element of failure attends the enterprise in future years no atom of blame can attach to one whose watchwords seem to be "thoroughness" and "efficiency."

Mr. P. W. Sothman.

At every stage of the lecture this characteristic of the speaker was the outstanding feature; the factor of safety in every departure of the enterprise was so satisfyingly large, almost, it may have been thought at times, unnecessarily so; the attention to details was so complete; the grasp of the whole immense system so comprehensive.

And, by the way, the immensity of the system struck many of the listeners for the first time as the speaker gradually unfolded the great Government scheme. Mr. Sothman is not building a mere transmission line—he is building a veritable network, a mesh of lines that shall entangle in its folds hundreds of cities and towns from Toronto westward. Nor will the system be complete in the near future. Ample provision is made for further extensions, for the addition of more meshes, and the entangling of more outlying towns. It is safe to predict an era of industrial advance all over southwestern Ontario such as has only been possible heretofore in the large business centres.

An interesting feature of the evening was a few pungent remarks from another outstanding personality of the Hydro-Electric scheme, Mr. F. H. McGuigan. Mr. McGuigan disclaimed any knowledge of electricity, that was not his profession. His remarks impressed one with the idea, however, that, like most men who profess to knowledge of only one subject, he knows his own particular business as well or a little better than anybody else.

The next meeting of the association will be addressed by Mr. P. M. Lincoln, of the Westinghouse Electrical & Manufacturing Company. Mr. Lincoln will speak on high tension transmission matters.

Hydro-Electric Power Lines

Mr. P. W. Sothman, on Dec. 4th, before the Engineers' Club, outlined the plan of transmission of the Hydro-Electric Power System and explained many items of interest in connection with tests that he had made on different towers, and various types of insulators. The lecture was well illustrated with lantern slides showing various stages in the experimental work. Pictures were also shown of a number of the step-down transforming stations, which indicate that the work is well advanced and the distribution of power no great distance in the future.

The following rates which will be charged for current are based on the distance of the places mentioned from the main line and the quantity of power taken: Toronto, $18.10 per h.p. per annum for a 24-hour day; Hamilton, $17.92; Woodstock, $23.50; London, $23.50; St. Thomas, $26.50; St. Mary's, $29.50. Mr. A. B. Barry, C.E., presided

The International Independent Telephone Convention

The meetings of the International Independent Telephone Association, held in Chicago during the second week of December, indicated both by numbers and enthusiasm the strength of this now well established movement. A few important changes were made in the constitution, among which was the changing of the name to the "National" Independent Telephone Association. Also the management of the association will henceforth be vested in a board of seventeen directors, elected by ballot at the annual meeting of the association, and holding office for the year.

The programme included contributions on telephone topics by some of the best known telephone men in America. One of the most important of these was by Mr. Francis Dagger, the secretary of the Canadian Independent Telephone Association, who spoke on conditions in Canada and outlined the progress of recent years and the prospects for the future in a paper of which "Telephony" says that "It was one of the best that has been read before the association, and was received with euthusiastic applause."

The report of the secretary of the association, Mr. J. B. Ware, dealt with the strength of the association, numerically and financially. According to the latest Government telephone census, the total number of telephones in the United States was 6,118,578, of which 2,986,515 are independent, for the most part not making Bell connections. It is claimed by the independent companies that this census, even at that time, was inaccurate, and that at the present moment they can lay certain claim to more than half the telephones in use. Speaking of the financial status of the various associations, the secretary stated that "the financial strength of the business was unquestioned. No other public utility had so little indebtedness per unit. There had been no important telephone failures and no other business, with which the general public had direct relations, had a record so entirely free from financial disasters."

Brockville Light and Power Department

The Brockville Light & Power Company has issued a statement of net revenue and actual cost of operation for the year ending Sept. 30, 1909, and also comparative statements covering operations for the last nine years, during which time this department has been under municipal control. The following figures representing the first and last of the nine years are of particular interest as showing the extent of growth during that period:

	1900-01	1908-09
Gas revenue	$18,145.32	$32,013.75
Electric revenue	12,448.06	19,901.61
Operating expenses	30,752.52	34,155.91
Depreciation	....	3,967.29
Surplus, after paying debentures and other expenses	855.77	864.71
Price illuminating gas, net....	2.00	1.12½
Price fuel gas, nett	1.25	1.12½
Price elec, cur. per k.w. hr, net	.20	.10
Actual net profit for nine years		$10,842.06
Total set aside for depreciatiin in nine years..		19,029.00

In view of the fact that this is one of Ontario's oldest and most extensive municipal ownership ventures, it will throw considerable light on the value of such an enterprise from a financial viewpoint if we place the statement side by side with that of a privately owned corporation, or, better still, a privately owned municipally controlled corporation, such as the Consumers' Gas Company of Toronto—a scheme of control which, to our mind, appears to possess most of the advantages and few of the disadvantages of municipal ownership.

Taking up the item, first, of gross revenue from gas business, Brockville, with a population of 9,000, receives $32,013. Toronto, with a population of 300,000, should, in the same ratio, yield a revenue of $1,067,000. As a matter of fact, gross revenue last year of the Consumers' Gas Company was about 70 per cent. in excess of this amount, the increase last year alone being one and one-half times the total volume of business seven years ago. The natural conclusion is that the business tactics of the private company are more aggressive than those of the municipal corporation.

The increase in revenue of the Brockville company in nine years has been from $38,154 to $51,915, i.e., about 37 per cent. The gross income of the private company has more than doubled in that time. Nor is this increase in income at the expense of the consumer. Brockville's plant is run ostensibly, not for profit but to supply the citizens with cheap power. The decrease in rates has been from $2 to $1.12½ for illuminating gas; from $1.25 to $1.12½ for fuel gas, and from 20 cts. to 10 cts. per k.w. hour for electric light. The private company during the same period has reduced from the already low price of 90 cents to 75 cents. Further, during this same period the private corporation has paid a dividend of 10 per cent. yearly, thus returning to the corporation 90 per cent. of its original investment; the municipality has paid off $51,253, which on a conservative estimate is one-third of the original outlay.

Last but not least comes the depreciation account. The private organization last year set aside 5 per cent. of the value of the plant and buildings, thus preparing for a renewal every 20 years. The municipality has set aside for renewals $19,029 in nine years, which works out that the original plant must last 71 years before a sufficient sum will have been set aside for a new installation.

Added to all this, the plant of the Consumers' Gas Company is recognized as being absolutely up-to-date and in the very best of repair, which, to say the least, is not said of the Brockville plant.

With all due respect to the management of the Brockville Light & Power Company, we cannot see in what way the venture has been justified or by what means, other than direct taxation, the citizens of Brockville expect to maintain and renew their plant in the near future. Judged from an impartial point of view, these two companies stand to one another in the same relation as two individuals with private incomes—one of whom is wise enough to live on his income alone and conserve his principal, while the other, for the sake of present, selfish interests and with no regard for those who come after, spends his income and each year also draws deeply on his principal, hoping only that the principal will last him out.

In the interests of municipal ownership we hope few such statements are destined to appear.

New Vacuum Pump for Metallic Filament Lamps

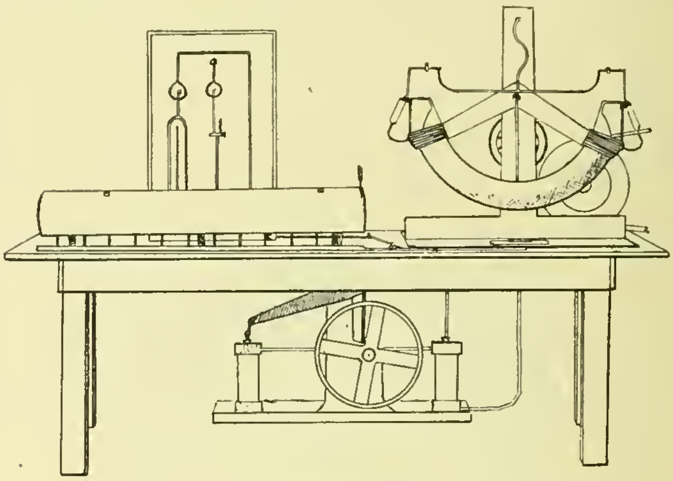
By A. Hosking.

Much of the trouble experienced with metallic filament lamps is due, not so much to defective filaments, as to the use of too high a voltage or too poor a vacuum. The accompanying figure illustrates the construction of an original style of pump devised by the writer, which, in operation, has proved both rapid and very effective, as the tests given below will indicate.

When the gas mantle was first introduced, the gas companies, without exception, did everything possible to crush this invention. The result of its introduction has been that the gas companies to-day are doing an immense increase in business, due almost entirely to this mantle.

Though the metallic filament lamp as an improved lighting medium is far in advance of the gas mantle and the saving in current simply enormous, the power companies throughout the world rose up in alarm at what they considered a menace to their earnings. The English and European companies have long since realized that the metallic filament lamp has come to stay and that instead of being a menace it is a means of increasing their business; the increased efficiency causing many to use electricity who before were afraid to do so, while public institutions and stores also take advantage of the increased light at the same current consumption. Most Canadian power companies have not yet realized this fact and have in some cases maliciously overloaded the wires so as to break every metallic filament on the circuit, but this prejudice is now gradually fading away.

The vacuum, however, was a more difficult subject to handle. The vacuum necessary in metallic filament lamps is very much higher than what is required for a carbon lamp, and scientific calculations have amounted to little, as experience has demonstrated that these ratios are quite at variance. Not only is a much higher vacuum required in tungsten than in carbon lamps, but, owing to the presence of foreign substance and gases, pumping is much more dangerous and the greatest care is necessary during this process. After several years' experience and study I have at last succeeded in making a pump that will create the highest vacuum possible, the gauge showing a vacuum of 0.00001 m.m. of mercury. The pump is mechanically driven by an electro-motor and consists of several chambers which are caused to oscillate, alternately sucking in the air and expelling it. The vapor pressure having been reduced, it was found that the pump not only gave the highest exhaust possible, but worked at least fifteen times quicker than the ordinary mercury pump. Oil pumps cannot give the very high vacuum required, owing to vapor tension, and all mercury pumps, as at present in use, work too slowly; with the new pump these difficulties have been entirely overcome. Each pump has been tested by an exhaust of standard capacity, the pressure being carefully measured by a MacLeod gauge of 300 cc. volume.



A Pump that Exhausts to .00001 mm of Mercury.

These pumps as now installed in the Canadian Tungsten Lamp Company's factory at Hamilton, are working most satisfactorily, and their speed is all that could be desired.

Seymour Power and Electric Company, Limited

The newly constructed hydro-electric development plant of the Seymour Power & Electric Company, Limited, at Campbellford, was placed in regular commission on Monday, Dec. 6th, for the transmission of current 22 miles to Deloro, to operate the machinery of the Deloro Mining & Reduction Company. This system replaces the steam plant which has carried the load for some years by means of two 100 k.w., 600 volt, 3 phase, 60 cycle A.C.B. generators.

The Seymour Company has also extended its transmission lines to Madoc, where it will supply the town with light and power and where also the company is under contract with the Geo. H. Gillespie Company for 150 h.p. to run the talc mill; to Belleville, where it will supply the Trenton Electric & Water Company, who are building a substation; to Sulphide, where it will be used to operate the works of the Nichols Chemical Company, and to Sterling. The installation has been in charge of Smith, Kerry & Chace, Toronto.

Experiment in Direct Current Transmission

A 2750 Volt Direct Current System Described—Many Difficulties in Installation—Operating Troubles Outlined*

By A. H. Barringer

The transmission of energy becomes a remarkably simple matter when direct current is employed, and given that the generators, rotary transformers, and apparatus could be brought to a sufficiently high voltage without the cost becoming prohibitive, and that they could be guaranteed as reasonably reliable and durable, then undoubtedly direct current would be an ideal agent. But the difficulties have proved so many, and the risks of installing such plants so formidable, that, except for a few isolated instances, direct current systems of any size operating at over 1,000 volts are practically unknown. Moreover, the results obtained from the few in operation can scarcely be called inviting enough to encourage such enterprise in this field. The following description of a d.c. system in Twickenham, a suburb of London, Eng., will, on this account, prove of general interest.

Twickenham is chiefly residential and, except for a few sawmills and the like, and the National Physical Laboratory, there are no power-users. This lack of day load is probably what influenced the designers to run d.c. in the first instance, for otherwise it is more than usually well adapted to alternating current. It is so scattered that there has been constant trouble in keeping the low tension network balanced and up to standard pressure. The area supplied at present is about 25 square miles, but the company have powers which will eventually treble that total.

The low tension mains, comprising about 60 miles of complete three wire, are all linked up into one network, fed at suitable points by rotary transformers, and, of course, largely from the central. The generating station is situated in about the centre of Twickenham, about two miles from one end of the district now operated, and between six and seven miles from the other. The transmission is by direct current at 2,750 volts, with future intentions of making it three wire at 5,500 volts.

Generating Station Equipment—The present H.T. equipment consists of two 200 k.w., 2,750 volt generators and one 100 k.w. 2,500:500 volt rotary transformer, with booster attached for raising the low tension side for transforming up, so that whilst during the day one H.T. set is run, supplying the two principal substations and the home rotary transformer, during heavy loads the home rotary transformer is taking current from the L.T. board and transforming up. This has saved installing another generating set.

Generators—The generators are four pole, direct coupled, running at 475 r.p.m. They are shunt wound, with shunt separately excited at 500 volts. These machines have now been running for about five years, and it is a curious fact that, although they have continually been in trouble from flashing over and other causes, the armatures have never had even a new former. For two years each machine was running without a break for 18 hours on each alternate day.

Switchboard—The switchboard (fig. 1) consists of nine panels. They are of iron throughout, with mica washers and bushings. There are two generator panels, six feeder panels, and a voltmeter panel. The circuit breakers are d.p. air break, and are ranged along the top, with a slate division between each set. Immediately behind are the change over switches, and above these the busbars. The generating switches are fitted with maximum and minimum cut outs, the minimum coil being fed from the 500 volt shunt circuits. The feeder cut outs are simple overload. At the bottom of the generator panels are the field rheostats and field breakers. Five of the feeder panels are fitted with line regulating resistances, L.T. long range operating switch, and paralleling voltmeters for running the automatic substations. The method and connections are shown on fig. 2, and will be referred to later. Each feeder is fitted with a surge arrester, consisting of a series of spark gaps in series with an oil tank resistance. These arresters were installed after one of the lines had been twice broken down on charging. Lastly, the voltmeter panel, which, as will be seen from the figure, has two electrostatic meters, and a plugging arrangement for paralleling and for plugging on to the three bars.

Transformers—The rotary transformers are two pole machines of overtype design, with double wound armatures running in a single field, and have copper brushes. They run at 500 r.p.m., and have a fixed ratio of 5 to 1. The regulating is done by the resistance in the high tension circuit. They are started up as series motors, and for this purpose are fitted with a small series field, which works in conjunction with a shirt-circuiting switch. The actuating solenoids of this switch are connected in series with the shunt-field circuit, which, in its turn, is connected straight across the L.T. end of the transformer. These switches are so adjusted that, when the L.T. pressure equals about 450 volts, the series field is cut out. The transformer bearings have small oil pumps working off a cam on the shaft ends, as well as the usual oil rings. These oil pumps have proved somewhat of an expensive luxury.

Substations—There are at present four substations, and these form what is perhaps the most interesting part of the system. One of them is a manual, equipped with two 100 k.w. transformers, H.T. and L.T. switchboards, and a 1,000 ampere hour battery. This is arranged after the same pattern as the generating station, but it is the automatic stations which will most likely prove the more interesting. Each of these is equipped with a transformer of 50 or 100 k.w., a set of balancers worked by a time switch, and a distance operated single pole L.T. circuit breaker. The only H.T. apparatus is the short-circuiter and a pair of switch fuses for isolating purposes. The Molesey station differs in that it has a 600 ampere hour battery and a small L.T. switchboard, but it is so arranged that it is worked automatically with the battery floating. A man cycles out every morning to put the battery on charge, and again in the afternoon to take it off. The other stations are visited only about two or three times a week.

The regulation of these stations is done from the central by means of the line resistance, and for starting up, etc., a five core .008 armored pilot cable is run back from each. (Fig. 2 substation arrangement.) Coming to the method of connection, it will be seen from fig. 2 that the actuating solenoid of the L.T. auto is connected from the opposite pole of the transformer and through to the "firing switch" at the central. From the firing switch another line is run back to the transformer side of the auto. Being on this side is important, as, were it on the other side, the switch could be operated whether the machine was running or not. As it is, when the machine is shut down there is no potential across the firing switch. This same line also serves for the paralleling voltmeter, whilst for the other side of this meter another line is taken from the busbar side of the auto. Across these lines the electrostatic pilot voltmeters are connected, the fourth line in the cable serving for their neutral and the fifth for the telephone.

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*Extract of paper read before Can. Soc. Civil Engineers.

Some Operating Troubles

Taking the substations first, the most frequent cause of trouble has been the H.T. brushes. These, as has been explained before, are copper, and when the commutator gets rough they have to be literally soaked with oil to prevent them wearing down between visits. Sometimes, too, they slip. Except for burning up the brushholders, this never does any actual damage. So far as actual damage is concerned, the oil pumps and the L.T. autos have been the worst offenders. The weakness in the oil pumps is a sight-glass fitted on the pipe leading into the bearing cap. These glasses occasionally crack, and the oil is pumped out on to the floor. Coming to the switches, it is necessary to first give a description of their action. The solenoid plunger operates the switch through a ratchet and pawl arrangement. When thrown in the switch is held by contact friction, the exciting current is broken, and the plunger falls back to its original position. Next time the solenoid is excited the switch is pulled out, and so on alternately. The trouble is with the pawl springs. These are only light spirals, and often break. When this happens the switch is only partly thrown in — to be exact, just into the carbon ends.

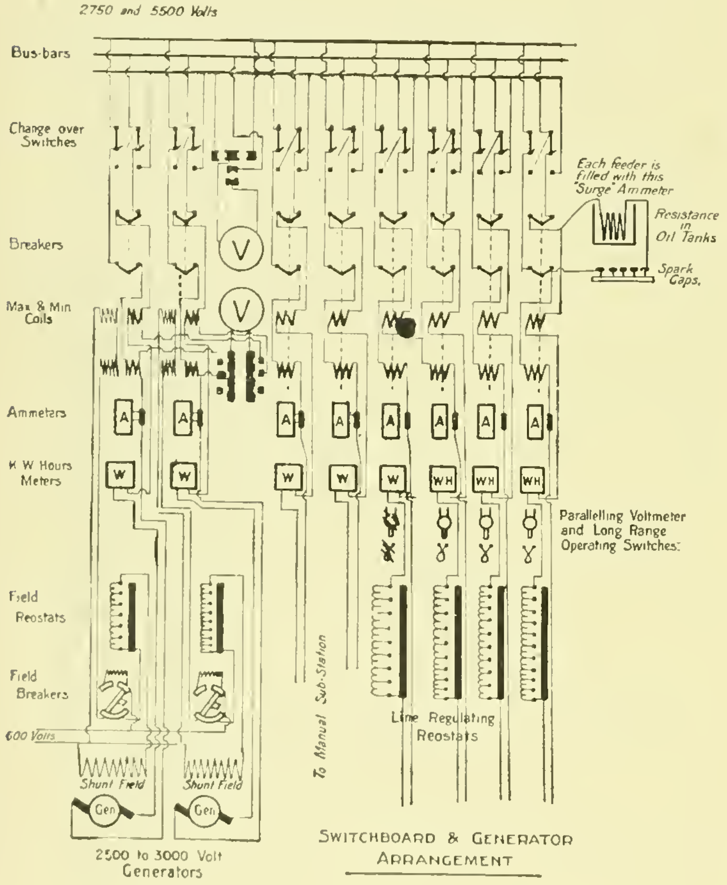

Fig. 1.

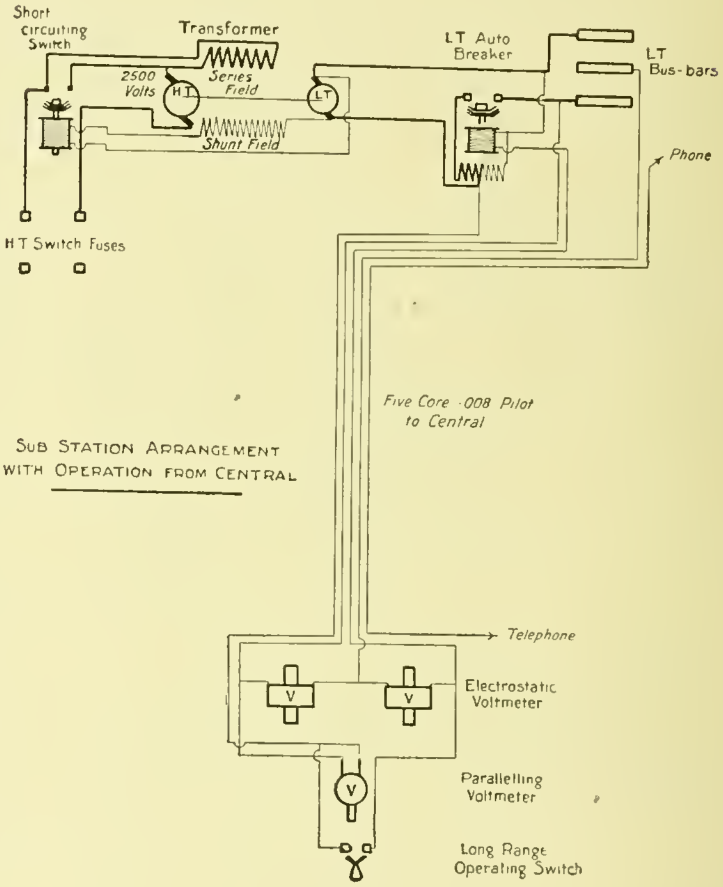

Fig. 2.

Then there are the short-circuiting switches. These are designed to fall out by gravity when the machine is shut down, but occasionally they will stick up. Another peculiarity of these switches is sometimes in evidence on starting up. If the pressure is higher than usual, or the starting resistance is cut out too quickly, the inductive effect set up by the series field is so considerable that a surge is started in the shunt, and the short-circuiting switch is thrown violently in and out for 20, or perhaps 30, times before the machine begins to revolve.

There are six transformers installed, and whilst being subjected to all manner of strain through short circuits etc., they have never been known to flash over. This may be due to the copper brushes. The chief trouble found with them is in the armatures and series coils. The latter, unless kept scrupulously free from copper dust, are liable to break down to earth. So far the system is not grounded on one side, and on one occasion the series field of an outlying transformer broke down to earth when the other side of the system was grounded in one of the generator ammeters.

There is one transformer in particular which seems to have an unfortunate penchant for discharging across the field air gap. The armature has been twice burnt out, probably through this, and the last time it was rewound it discharged so badly that it could not be run. There was a continuous stream of sparks right along the armature tunnel. It was found that the only measure to stop it was a coat of insulating paint on the pole-pieces. A standing menace which has been active on one occasion is the danger of losing the shunt-field. This has been provided for in so much that it is made fool-proof by dispensing with lifting attachment on the L.T. brushes. What is likely to happen if the field is faulty was seen on the home transformer on the first starting up of the plant. Somehow a faulty connection in the shunt-field circuit was overlooked, and when the current was switched on the machine built up in speed until the binders burst. An idea of the speed attained may be gathered from the fact that when the current was switched off the armature took well over five minutes to come to rest.

A serious drawback to these transformers presents itself in time of mains trouble. The L.T. network pressure is 480 volts, and, in time of a bad short-circuit, this may fall as low as three, or even two hundred, volts. The transformers will not come down as low as this, and to switch them in at, say, 400 volts is simply to throw the breakers out. The only way is to catch them speeding up, but then the series field is not cut out. Once, in very desperate straits through a dead short on a .5 feeder, a transformer was switched in in this manner as a last resource, in the hope that the short-circuiting switch would act on load. But the hope was misplaced. In five minutes the machine was on fire.

Coming now to the generators, as has been previously stated, the chief trouble is in commutation. This remark must not be misunderstood, for, when everything else is right, the commutation leaves nothing to be desired. But it is when there is outside trouble that the generators behave badly. A transformer burning out, or a short circuit on the mains, and sometimes even a big jump in the load, will cause them to flash over. Beyond burning off a belt or pitting the commutator no harm is done to the machines. But it is awkward in other ways, for if two machines were running in parallel, and one went, undoubtedly the other would go too. As was remarked earlier, it is the intention in the future to run it as a three wire system, with two machines in series.

The switchboard has not so far given any trouble, except for voltmeter panel blowing out. At first there was a little difficulty in breaking the shunt-field current. The switches are single pole, and threw a high resistance across the shunt when breaking. They are enclosed in an iron frame, and the arc on breaking would sometimes ground the L.T. system. Finally they were enclosed in asbestos boxes.

Summing up, the most inefficient part of the system is in the method of regulation. When, as is nearly always the case, one station is taking a comparatively heavy load, then the H.T. pressure must be run 100 or 200 volts higher than would suffice for the other stations. Consequently, this energy has to be absorbed in the regulating rheostats, and entails a very serious loss. Apart from this, the transformer efficiencies are very high.

Finally, a word on the mains. These are, of course, in all cases underground, and, except for the troubles before referred to, due to the surging, there was only one fault developed on the H.T. system in five years. The cables are .5 two-conductor concentric, paper insulated, with lead sheath and outer steel wire armouring. The method of laying is to draw them into earthenware conduits. They cannot be spoken too highly of.

The L.T. mains are of what is known as the solid system. The cables are coated with vulcanized bitumen, the only other protection being a covering of thick braid. They are laid in wooden troughs, supported on wooden bridges, the troughs then filled solid with bitumen, and a layer of tiles put on top.

These mains have been an endless source of trouble. The troughing rots, the bitumen cracks, and the water gets through to the cables. Sometimes a "short" will burn away as much as 50 feet of cable. But the most remarkable thing is that the mains have been opened up and not a vestige of copper found for as much as 18 feet, yet at the same time a motor has been working beyond the break.

There have been as many as three breakdowns in a day, and for a year the average mains faults have not been less than four a week.

The Government's Side of the Disallowance Question

The Ontario Government has presented its side of the case on the question of disallowance now before the Dominion Government and submitted the following arguments:

The Hydro-Electric Act deals with property and civil rights in the Province of Ontario, and is both legal and constitutional.

It does not clash with the legislation of the Dominion Parliament.

It does not affect the interests of the Dominion generally.

The Act does not injure the credit of municipalities, but has increased their credit and enabled them to sell debentures at higher prices.

The argument that the use of the waters of the Niagara River are under the control of the Dominion Parliament has no bearing on the question of disallowance.

If the Ontario Power Company, or any other power companies, have no right to take water from the Niagara river without the leave of the Dominion, that is a matter between the power companies and the Dominion, and not in any way affected by the legislation sought to be disallowed.

The allegation that no provision is made for payment of compensation by the commission for obtaining easements is answered by stating that the construction applicable to certain Acts is that compensation must be given, and, in fact, there was no other intention on the part of the commission or the Legislature. If there is any doubt as to this, it can be made clear by the Legislature at its next session.

The Provincial Legislature can, in fact, stay actions, such power having been exercised again and again without question, and it must not be assumed that the Legislature will directly or indirectly misuse its power.

The action of the Hydro-Electric Commission is for the benefit of the power companies, because such action will give them many more consumers for their output.

The claim that the credit of the Dominion will be affected by the legislation in question is unfounded.

The people of the Province of Ontario cannot submit to any check upon the rights of the Legislature to legislate with reference to subjects within its well-defined jurisdiction, although a technical right to disallow may exist.

Recent Patents Issued

The following is a list of patents recently issued by the Canadian Patent Office relating to electrical arts, and furnished by Fetherstonhaugh & Company, 5 Elgin street, Ottawa; Russel S. Smart, resident:

122,021—J. H. Field, Victoria, B.C.; means for controlling electric fire alarm and call bell.

122,139—A. L. Tourgis, Toronto, Ont.; induction coils.

122.454—J. Pattison, Prescott, Ont.; thermo electric alarms.

The Nobel Prize for Chemistry has been awarded this year to Prof. Osward, and the Physics Prize will be divided between Mr. Marconi and Prof. Braun, of Strassbarg.

Light and Power Rates for Central Stations

The Two-Rate Basis most Satisfactory—The Sliding Scale Plan Explained by Mr. George McLean

At a convention of the Illinois State Electric Association held recently, the subject of rates for electric lighting was discussed in two papers, one dealing with conditions in towns of 15,000 or over ,the other with small towns and villages. Speaking generally, the plan favored in both large and small centres was that calculated on the two-rate basis representing actual cost plus a fair profit. Since lighting problems are much the same the world over, the following details will interest, almost equally, the Canadian central station operator:

Towns of 15,000 and Over

Dealing first with the business section, the speaker calculated that station equipment at $125 per kilowatt may be considered a fair average. To determine the primary rate an allowance of 5 per cent. each for interest, depreciations and profits was made. This total of 15 per cent. on $125 is $18.75 a year, or $1.56 a month, which, on the supposition of 30 hours use per month by each customer of the equipment installed to serve him, places the charge at $1.56 \div 30 = 5.2$ cents per k.w. hour. This amount, then, represents the excess over actual operating expenses that any plant must return to justify the original investment.

The secondary rate, i.e., the rate to the customer, is made up of the actual cost of energy at the consumer's meter plus the above profit. Assuming the operating cost to be 5 cents per k.w. hour, the total rate for one hour's use per day would be $5 + 5.2 = 10.2$ cents per k.w. hour; for two hours' use per day cost would be $\frac{5 \times 2 + 5.2}{2} = 7.8$ cents per k.w. hour; for 5 hours' use per day cost would be $\frac{5 \times 5 + 5.2}{5} = 6.04$ cents per k.w. hour, etc. This method of computing the charge is in successful operation in such cities as New York, Chicago, Des Moines, Omaha and Cleveland.

A larger investment is necessary in station apparatus for residential sections, and a correspondingly larger rate must be charged. In a town where a rate of from 10 to 5 cents could be offered for business districts, a charge of from 15 to 7 cents would be proportional for the residential service.

In the discussion that followed the objection was raised that few companies know, or can even roughly estimate, the actual cost of energy, either at the switchboard or the meters, and the equipment of switchboards with watt-hour meters was recommended. These, if read frequently, would enable the engineer to keep in close touch with the energy consumption at all times. Objection was also raised to the low capitalization of $125 per k.w.; the cost of meters alone might amount to $100; the consensus of opinion inclined to the belief that a figure of from $200 to $400 would be more nearly correct. On the estimate of $250 for equipment per kilowatt, the rates given above would be materially higher—for one hour's use per day it would become $5 + 10.4 = 15.4$ cents per k.w. hour; for two hours' use per day $\frac{10 + 10.4}{2} = 10.2$ cents per k.w. hour, and so on.

Rates in Smaller Towns

The charges in the smaller towns, it was held, would not vary any more from those in the larger towns than they would vary with one another, due to local conditions or to individuality of the management.

A well equipped plant in a small town requires an investment of about $200 per kilowatt of equipment or connected load. The standing or fixed cost, calculated at 15 per cent. as before, is thus $30 per year, or a little over 8 cents a day. Placing the running cost at 4 cents per kilowatt hour, the rate to a customer using one hour a day would be $8 + 4 = 12$ cents per kilowatt hour; taking two hours' service per day would cost the consumer tems of charges were outlined—the competition plan of getting what can be obtained of each customer, which $\frac{4 \times 2 + 8}{2} = 8$ cents per k.w. hour, etc. Various other sys- invariably ended in trouble; the flat rate, which encourages wastefulness; the discount plan, where a straight maximum rate is charged, with discount increasing in steps with the increasing amount used—this plan causes overlapping, since a customer may, by using just beyond a step, get service for less than if he had ceased just before reaching that step. The method of giving large discounts, say 30 per cent., for prompt payment of accounts came in for criticism, inasmuch as the customer got the impression of immense profits if such a discount were possible. It was held, too, that no court of law would recognize such a large rate and it would be impossible to enforce the payment of overdue accounts.

Meter Investment Unduly Large

It was pointed out, in discussion, that while the cost of a modern steam generating plant may not exceed $100 per k.w., and the distributing system from $100 to $150 per k.w., depending on whether distribution was overhead or underground, the meter equipment often ran as high as $100 per k.w. of station equipment. The investment in meters often was out of all proportion to the value of the remainder of the plant. Emphasis was laid on the necessity for low priced meters for small or house customers. In residences the maximum demand was only from 20 to 30 per cent. of the connected load, as compared with 60 per cent. to 70 per cent. in stores. Thus a house customer with, say, 20 lamps installed would only use about one-third as much current as a store with the same lamp equipment, while the investment for meters would be the same in each case.

The Sliding Scale Plan of Fixing Rates*

By George McLean

This ideal arrangement will be found in a wise application of the "sliding scale" plan which, properly instituted, works as automatically as the steam gauge on a boiler. Under this plan, the corporation, if it can make them, is allowed net earnings sufficient to pay a certain dividend based upon the value of its property as determined by investigation. For every certain increase in this dividend it must make to its patrons a certain reduction from the standard rate. Thus the public is made a partner in the enterprise and guaranteed full participation in any advantage which may arise from the superior skill, economy and progressiveness of private management.

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*Extract from a paper read before the Iowa District Gas Association.

Public feeling against public service corporations is generally due to suspicion of inordinate profits. This suspicion cannot exist in the presence of the sliding scale with its automatic regulation of profit. The sliding scale seems to answer the question of how the public service corporation can be removed from politics, not only from local but from state politics, and from the field of political discussion. Where this plan exists there can be no excuse for duplicating service, no excuse for a municipal campaign based upon a promise to regulate the rates of a public service corporation and relieve the people of alleged extortion, no excuse for the charge that the public service corporations have corrupted the city council or the state commission. With the rate regulating itself automatically there will be no color of necessity for regulation by the city council or a state commission. The sliding scale seems to point the way to peace and good will, prosperity and permanency.

Voltage Regulation an Important Factor in the Life and Efficiency of an Incandescent Lamp

One of the most important factors in the economical management of an incandescent lighting system deals with the careful regulation of the voltage. It is possible many central station men are not fully aware of the marked effect of very small variations in potential, on the life of lamps or on the quantity of illumination they provide. The variations in the average system are considerable and where the trouble has been taken to tabulate the voltage readings for a considerable time or to take a graph of the movements of the indicating needle. the results have shown variations, up or down, of several volts, often in a few minutes.

The accompanying figure (fig 1) indicates the diminution in candle power for small drops in potential. One per cent. fall of potential reduces the candle power nearly 7 per cent.; 2 per cent. drop in potential reduces the candle power 11 per cent.; 3 per cent. fall in potential reduces the illumination about 16 per cent.; 4 per cent. fall about 20 per cent.

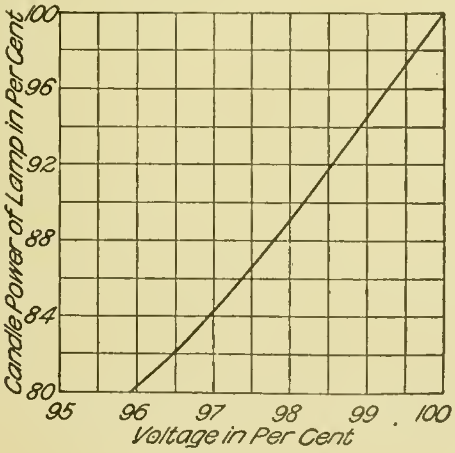


Fig. 1.

The second diagram (fig. 2) indicates the still more marked effect on the life of a lamp of small increases in potential above the normal. An increase of 2 per cent. shortens the life of the lamp 30 per cent.; an increase of 4 per cent. cuts the life down more than half, and so on. Any device that regulates the voltage of lighting circuits will plainly go a long way towards reducing the operating cost of a lighting station.

A New Lighting Invention of Interest to Curlers

Some two years ago, Mr. R. S. Kelsch, consulting engineer, Montreal, was called in by the Montreal Curling Club to devise a scientific system of lighting for the club's rink. After considerable experimenting and arrangement of the lighting to obtain a certain quality of light, certain foot candles, absolute uniform distribution and the devising of a scheme whereby the lights were removed from the eyes of the players, etc., it was found that there was something lacking and something that seemed to be even more pronounced than it was previous to the installation of the new system.

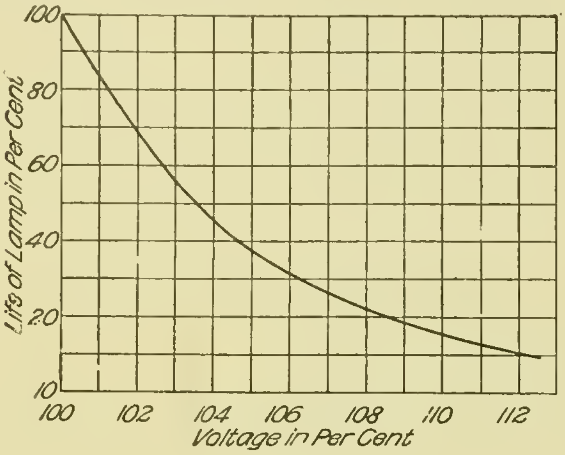


Fig 2.

Further experiments were tried, and it was found that the stones appeared to travel faster at one point than at another, and the players would sweep when they should not, and would fail to sweep at the right time. Mr. Kelsch was convinced that the modern lighting methods brought out a defect which seriously interfered with the game of curling, and that was—the color of the ice due to the method of freezing, and particularly to the background of the ice.

To overcome this defect, a roll of white paper such as is used for printing newspapers was secured, and with this the ground was carpeted and a sheet of ice formed over the paper. The results achieved were simply wonderful, the ice taking on a mirror like appearance.

By the change the curling stone was made more conspicuous and the uniform surface gave a uniform speed to the stone, obviating the trouble experienced prior to the use of the paper, where the stone appeared to move faster or slower according to the color of the ice. A number of curlers from all over the country, who visited the Montreal Curling Rink at different times during the past winter, found the change so beneficial that curlers in general have adopted the device, which has been patented by Mr. Kelsch. We understand that specifications are available, showing how any sized curling rink may be lighted in order to obtain the best illumination with the least power consumption.

With the recent introduction by the Electrical Accessories Company, of New York, of tungsten lamps rated at 600 and 1,000 c.p., there are now available tungsten lamps ranging in candle power from 16 to 1,000, those above 100 being rated at 200 c.p., 300 c.p. 400 c.p., 600 c.p., and 1,000 c.p.

Montreal and District

"Electrical News" Office,
Board of Trade Building,
December 24th, 1909.

The Hull Electric Company, of Hull, Que., recently added two new cars to their electric railway system. These cars were supplied by the Ottawa Car Company and are equipped with 110 B. type motors and other Westinghouse equipment.

Messrs. Scott & Rubenstein, electrical contractors, 342 St. James street, have recently dissolved partnership. The company's business is being continued by Mr. Rubenstein at the same address.

Mr. C. S. Bagg, assistant secretary-treasurer of the Montreal Light, Heat & Power Company, has been appointed to the position of storekeeper, left vacant by the death of Mr. Edwards. Mr. G. Chagnon, general cashier, now becomes assistant secretary-treasurer, while Mr. L. Moncel, the present cashier, is promoted to Mr. Chagnon's former position.

The Canadian Westinghouse Company, Limited, of Montreal, are installing a hoisting motor for the Black Lake Consolidated Company, which is designed for this class of work from tests and curves made by the Shawinigan Water & Power Company. A special low speed controller is used in connection with its operation.

We extend congratulations to Mr. C. V. Christie, of the electrical engineering staff of McGill University, who was married on Dec. 16th to Miss Edith Mowatt, of Montreal.

Mr J. A Walls, of Shawinigan, Que., for a number of years chief engineer of the Shawinigan Water & Power Company, has been appointed chief engineer of the McCall Ferry Power Company, McCall Ferry, Pa. Mr. Walls is well known in the eastern part of Canada, having for several years very successfully filled a similar position for the Shawinigan Water & Power Company, of Shawinigan, Que.

Messrs. Ross & Holgate, consulting engineers, Montreal, engineers for the Woodstock, Ont., municipal electric light plant, have recently awarded to the Canadian General Electric Company, Limited, of Montreal, the contract for the supply of one 350 k.w. synchronous motor, three 300 k.w. transformers and also for switchboard equipment. The order for induction regulator for motors and motor driven pumps was also awarded to this company. It is expected that installation will be made some time in the spring.

The 400 k.w. Belliss & Morcom engines installed in the Westmount municipal plant by Messrs. Laurie & Lamb, were placed in operation two weeks ago.

An interesting installation of two 3,000 k.w. high pressure steam turbines, to operate at 1,500 r.p.m., has recently been made by Belliss & Morcom, Limited, for the municipality of Johannesburg, South Africa.

The Quebec Railway, Light & Power Company contemplate abandoning the use of steam locomotives on their Ste. Anne line, and Mr. R. S. Kelsch, consulting engineer, Montreal, is making an investigation and report covering the question of electrifying the road. 1,200 volts direct current and single phase, 25 cycle, 11,000 volt, systems are being considered.

Mr Edward A. Evans, general manager and chief engineer of the newly organized Quebec Light, Heat & Power Company, was in Montreal recently in connection with the interests of the new company.

Mr. W. N. Dietrich, consulting and contracting engineer, 16 St. Sacrament street, is installing the electrical equipment in the new factory of the Heney Company, Limited. The motors are being supplied by Messrs. Fred Thomson & Company.

Mr. W. J. B. Drew, chief agent of the Montreal Light, Heat & Power Company, has resigned to accept a position with the Canadian Light & Power Company.

Mr. Julian C. Smith, electrical engineer of the Shawinigan Water & Power Company, attended a meeting of the high tension transmission committee of the A.I.E.E. which was held on Thursday, Dec. 16th, in New York. An interesting paper was read by Mr. Henry L. Doherty, entitled "Comments on Development and Operation of Hydro-Electric Plants."

Mr. B. McDonald, for many years connected with the Montreal Street Railway, and until recently superintendent of the Mexico Tramways Company, has been appointed superintendent of the Citadel division of the Quebec Railway, Light & Power Company.

The Jonquiere Pulp Company, of Jonquiere, Que., have just placed an order with the Canadian Westinghouse Company for the installation of a 75 h.p. motor for paper mill work.

Mr. Read, manager of the Colonial Engineering Company, has just returned from a trip to London, Ont., and reports that his company's installation of a 300 h.p. Hornsby-Stockport producer gas engine equipment in the new Hyman tannery was completed about two weeks ago, and has since that date been successfully supplying a 24-hour day service, the load averaging during this period 250 h.p. per day. The installation consists of two 150 h.p. units, one of which is geared to a 125 k.w. generator, which operates the motor load in the Hyman building, and also supplies power to the Murray Shoe Company, situated just opposite the former factory. The second unit is belted to the line shafting and operates all the tannery machinery for the Hyman Company.

The Mond Nickel Company, Limited, Wabagesick Chute, Vermilion river, Ontario, have decided to double their present plant, which was installed a year ago by the Allis-Chalmers-Bullock, Limited, of Montreal. The installation at that time consisted of a 2200 h.p., 300 r.p.m., 50-foot head, horizontal twin turbine; a 1500 k.w., 2200 volt, 60 cycle water wheel type alternator; a 110 h.p., 875 r.p.m. exciter turbine; a 60 k.w., 120 volt exciter generator; three 800 k.w., 2200 to 16500 volt transformers; governors, switchboards and other apparatus. The company have just ordered the duplication of this apparatus. The power generated at this point is transmitted to Victoria Mines, a distance of 15 miles, the voltage being approximately 16,000, and is used to operate the smelter plant of the Mond Nickel Company. 2000 h.p. Allis-Chalmers-Bullock induction motors are used to operate the machinery, and for some time past the electrical equipment has been taxed to its fullest capacity, and this has led the company to their present decision of doubling the capacity of their plant.

The work on the auxiliary steam plant of the St. Francis Hydraulic Company, at D'Israeli, Que., is making rapid progress. The extension to the power house is completed, and the erection of the boilers, engine, etc., is well under way.

The power house is now equipped with three water wheel generator units of 1,200 h.p. each, making a total of 3,600 h.p.

For some years past the St. Francis Hyraulic Company confined its operations to Black Lake and Thetford Mines. At the present time they are carrying their transmission line to Robertson, Que., where they have secured new power contracts. Mr. M. A. Sammett, of Montreal, is the consulting engineer for the company.

Mr. Walbank's Successor

In connection with Mr. Walbank's death, it has been rumored that Mr. R. S. Kelsch would succeed Mr. Walbank as chief engineer to the Montreal Light, Heat & Power Company. However, we are informed from thoroughly reliable sources that Mr. Kelsch has no intention of making any change. While his twenty years' operating experience with various large light and power companies would make him a valuable addition to the company's force, it would, no doubt, not be to Mr. Kelsch's personal interest to make such a change, since his private practice, which extends throughout the country, is very remunerative.

Mr. Kelsch is the Montreal Light, Heat & Power Company's consulting engineer, and has been employed in this capacity since the consolidation of the Lachine Rapids Hydraulic & Land Company, and it is understood that he will still continue to act in this capacity. On the highest authority it is stated that Mr. Walbank's position will not be filled for some time at least.

Notes From McGill

Prof. Herdt left recently for Winnipeg, and will be absent for several weeks in connection with the accident which occurred to the power system in that city.
city.

Mr. Percy Cole, of the Allis-Chalmers-Bullock staff, addressed the McGill Electrical Club on Dec. 6th. Mr Cole dealt in a very interesting manner with modern practice in electrical manufacturing. Mr. Hyde, of the engineering department of the Montreal Light, Heat & Power Company, will be the next speaker at the club's meeting, on Jan. 10th. He will discuss the substations of the company.

New Plan of the McCall Ferry Power Company

Mr. R. S. Kelsch, consulting engineer, Power Building, Montreal, who is consulting engineer for the McCall Ferry Power Company, McCall Ferry, Pa., advises that the McCall Company expect to have ready for delivery at least 50,000 h.p. within the next twelve months.

This plant is one of the most interesting on the American continent, the units, in weights and dimensions, being the largest in the world.

Ten turbines of the double runner type, each runner having a diameter 10 feet 6 inches, together with two 1,000 h.p. turbines, will compose the hydraulic installation. A complete water wheel and generator will weigh 1,200,000 pounds, while all rotating parts of the units weigh 380,000 pounds each, and operate at 100 r.p.m.

Since the reorganization of the company many changes have been made, and one of the most interesting noted is the change from the use of oil thrust bearings to carry the rotating parts as specified in the original plans. These bearings were to operate at a pressure of 250 pounds at the receiver.

The engineers now in charge of this property have in place of the oil thrust type ordered roller bearings for this work. These bearings will be furnished by the Standard Roller Bearing Company, of Philadelphia, Pa., and are designed to carry 400,000 pounds, and are guaranteed to operate continuously at double normal speed and with 25 per cent. overload.

One of the interesting features of the roller bearing consists in the fact that it is practically impossible for an accident to occur or to have any damage done, due to the failure of the bearing. A great saving is also made in the oil used and pumping required. Thrust bearings for this plant would require pumping capacity for about 1,200 gallons per minute, whereas the roller bearings for the entire plant will require not more than 30 gallons per minute. The use of this style of bearing is a radical departure from present practice. They have been tried at Niagara Falls, but the load at this station on these bearings is only 160,000 pounds, as compared to 380,000 pounds, and furthermore, the bearings at the Niagara power station have been installed at the present time for use only as auxiliaries. A number of similar interesting changes showing wide departure from ordinary practice have also been made by the present engineers.

Quebec Electrical Association

The monthly meeting of the Quebec Electrical Association was held in the association's rooms, Inglis Building, on Dec. 9th. At this meeting, Wednesday, Jan. 12th, was fixed as a date for the first annual banquet of the association. This affair gives promise of being a huge success, and representatives of several prominent organizations are expected to be present.

A communication was received from Mr. J. Bennett chief electrical inspector for Quebec of the Canadian Fire Underwriters' Association, calling attention to the hazard involved at this season of the year in show window and display lighting if not properly carried out. He pointed out that mains and branch switches should be properly fused and that inflammable material should never be placed in the vicinity of switches, flashers and other electrical devices having exposed contacts. Asbestos fibre or mineral wool was recommended in place of cotton batting by Mr. Bennett, where it is desired to simulate snow.

It was decided by the association to call the attention of the members to Mr. Bennett's letter and to advise them to consult with him in all cases where doubt might exist as to the regularity of any installation.

New Plant for Asbestos Company

The Jacobs Asbestos Company, Limited, Thetford Mines, Que., who are a new company in the asbestos field, have just placed an order with the Canadian Westinghouse Company, Limited, of Montreal, for the complete electrical requirements for their new mills. The plant is to be in operation by the first of May next and will be very extensive, containing six cyclones.

The motors to be supplied are the heavy cement mill type designed for asbestos work, and the specifications called for the installation of the round rotor type with external grid resistance and for the use of drum type controllers. These motors will be 2200 volt, three phase, 30 cycle type, and the following sizes will be installed: One 250 h.p., one 150 h.p., six 125 h.p., two 100 h.p. two 50 h.p., one 30 h.p., one 15 h.p., 440 volt, and one 50 h.p. back geared motor. A motor generator set consisting of one 75 h.p. motor and one 50 k.w. 110 volt compound wound generator and two 10 k.w. transformers will be installed.

The panel board will be quite large, consisting of a power panel, a motor generator set panel, and sixteen panels for the motor circuits, each containing an ammeter with circuit breaker for overload, no voltage release.

Electrical Progress in Western Canada

Activity in All Branches Electrical Invention of Great Interest—Electrolysis Troubles—Vancouver Island to have $1,500,000 Power Plant

Mr. A. S. Woolf, the representative of the Canadian Tungsten Lamp Company, is registered at the Royal Alexandria, Winnipeg, on his way to the coast. He reports business exceptionally good in the West.

The date of Dec. 20th has been set by the B.C.E.R. for the opening of traffic on the first 12 mile section to Cloverdale, of the Westminster-Chilliwack branch. Construction on the new terminal station in New Westminster will begin immediately after New Year's.

Mr. Fenton B. Mather, of the electrical firm of Mather & Yuill, Vancouver, B.C., left for Winnipeg on Dec. 13th to assume charge of the Lac du Bonnet power plant of the Winnipeg Electric Railway, which was recently damaged by high water. Mr. Mather is familiar with the plant, having been superintendent in charge before removing to the coast, and for that reason Mr. J. S. Mackenzie, assistant general manager of the street railway, was desirous that he should be entrusted with the task of restoring the plant's efficiency.

At a recent meeting of he employees of the British Columbia Electrical Railway Company, for the purpose of electing officers of the British Columbia Electric Company section of the National Electric Light Association, the following gentlemen were chosen: Honorary President, Mr. R. H. Sperling; President, Mr. J. George Lister; Vice-President, Mr. H. E. Grant; Secretary-Treasurer, Mr. K. B. Ryan; Executive Committee, Messrs. D. R. Kennedy, C. Rummell, W. T. Woodroofe, L. G. Robinson. The object of the section is to foster and promote the common interests of its members, to advance scientific and practical knowledge in all matters relating to electric light and power companies, and also to establish cordial and beneficial relations with kindred associations and between the members of the association.

City Electrician McCullough, of Vancouver, has tendered his resignation as a result of the strictures passed upon him by some of the aldermen, who were dissatisfied with his handling of the work of his department. The fact that the estimates for the Granville street bridge lighting system were largely exceeded gave his opponents their desired opportunity.

The Dominion Government's new wireless station at Ikeda Head, Queen Charlotte Islands, was completed some weeks ago, the results of which the provincial elections being the first message received from Victoria. Communication was also established with Ketchikan, 198 miles distant, and with several steamers off the coast Another wireless station will be established on Digby Island, at Prince Rupert.

The citizens of Fernie B.C., are now in full enjoyment of the city's new electric light system, the turning on of the current taking place on Dec. 4th. Since the big fire over a year ago, other sources of light had to be utilized, and the inconvenience resulting therefrom was great.

The Electrical Construction Company of Vancouver, which handled the Granville street bridge and Winch Building lighting systems, has been awarded the contract for the complete electrical equipment of the Woodward apartment building now being erected.

An electrical invention of great interest to the West is attracting much attention in Winnipeg. It is a system by which electric light and power are generated from primary batteries, the same as those used in telegraphic offices, by chemical agencies only. The light is extremely brilliant, and the power is sufficient to drive small motor boats, cream separators, etc. Prof. Allan, of the Manitoba University, after a tevere test, pronounced the invention of great commercial value, with great possibilities. The cost of the material consumed during the test of 57 hours is about 25 cents. The invention is considered one of the electric wonders of the age, and experts say that Dr. Darby, of Winnipeg, the talented chemist, has accomplished something that Edison has long been striving to attain.

The Kootenay Telephone Lines, Limited, have been steadily extending their system for some time, and connection has been effected with the Alberta system by establishing exchanges in Michel and Hosmer. In the spring a line will be built to Spokane, and eventually connection will also be established in the near future with Creston and Nelson.

General Masager Sperling, of the B. C. Electric Company, who returned recently from England, is now at work on the extensive programme of improvements to be carried out in 1910, the British shareholders having authorized the expenditure of some six millions of dollars. The new power plant for Victoria will absorb about a million and a half of the amount.

The Automatic Telephone Company, of Chicago, is negotiating for a francrise to instal its system in Prince Rupert.

The Pacific Radio Company plans to have towers erected in Vancouver, Victoria, Bellingham, Everett, Tacoma, Portland, Spokane and Calgary next season. Dr. Lee de Forest, one of the company's engineers claims that the Rocky Mountain range will offer no obstacle to the efficiency of the wireless telephone, and believes it will be possible to obtain a perfect service between Vancouver and Calgary.

South Vancouver municipality, which is putting in a water system, has let a contract for an electrically driven pump capable of delivering at least 6,400 gallons of clear water per hour through 7,000 feet of 6-inch pipe against a total head of 200 feet. The pump is to be driven by an a.c. motor, direct connected, three phase, 60 cycle, 220 volts.

Electrolysis is playing Nab with some sections of Vancouver's water mains, according to a recent report made by Electrician McCullough to the city council The matter has been taken up with the Street Railway Company, whose vagrant current is said to be causing the damage.

The Grand Trunk Pacific's electric lighting plant at Prince Rupert was destroyed by fire a couple of weeks ago, and a temporary plant has been installed on the wharf to supply their office building and warehouses. The Board of Trade is agitating for a civic plant.

The British Columbia Electric Railway Company contemplate the establishment in Vancouver in the near future of a powerful steam auxiliary plant, to take care of their street railway and lighting service in the event of an accident to their electric power plant at Lake

Buntzen. The steam units will be established on the site of the company's old power plant on Barnard street east. The cost of the plant will be about $250,000. The recent accident at Winnipeg where, through the breaking down of the electric plant at Lac du Bonnet, the whole city was left without light or power for some days, finally decided the B. C. Electric Company to proceed at once with the installation of the auxiliary plant—a step which had been under discussion by the management for the past year.

Preliminary work has been under way for some weeks in connection with the clearing of the right of way for the new transmission line of the British Columbia Electric Company between Victoria and Jordan river, some 35 miles distant, where the new power plant will be located. The cost of the new works is estimated at $1,500,000. Plans and specifications for the extensive machinery and electrical apparatus which will be required for the new power house have been prepared and forwarded to the leading electrical supply houses on this side of the Atlantic and in Great Britain, and tenders will be received in due course. It is expected that the plant will all be in readiness by the time the power house and other necessary works are completed at Jordan River, and no time will be lost in the installation.

The new extension of the British Columbia Electric Railway line from New Westminster to Chilliwack will be 64½ miles. Superintendent Allan Purvis has an army of men rushing the work, the steel being laid at the rate of one mile per day. No grade on the entire stretch will be greater than 2 5-10 per cent. The power to operate the line will be supplied by the station at Lake Buntzen, coming over the high tension lines in its full voltage, to be reduced to operating voltage by the five substations, located at Chilliwack, Sumas Mountain, Clayburn, Mount Lehman and Cloverdale. The reduction sections will be reinforced concrete structures and will each represent to the company for the buildings alone an expenditure of $25,000 to $35,000, while the machines therein will be 300 to 600 k.w. power. The system will be operated on standard time. The rolling stock will consist of a combination train, including freight cars. These cars will be operated under the multiple unit system and coupled by the A.M.M. type of air and the junction box electrical connection, and will run jointly under one motorman, at the same time each car propelling itself. The new controller differs from that in use at present by being only about a foot square, but having about 3,000 connections with the group switch. For freight transportation the company has purchased three 50-ton motor locomotives. One of these motors is in use at present, and is giving perfect satisfaction.

The new 10,000 h.p. electrical unit at the Lake Buntzen generating plant of the British Columbia Electric Railway Company, work on the installation of which was in progress for over a year, is now in service. The new machinery includes a "Doble Tangential" water wheel—the largest ever made—built to the order of the Abner Doble Company, San Francisco, by the John McDougall Caledonia Iron Works, of Montreal. The equipment consists of two wheels each, one set on each end of the generator shaft, two nozzles on each wheel, and a relief nozzle in the wheel pit for governing. This nozzle opens when the operating streams are shut off, in order to prevent any undue increase of pressure in the pipes (due to the 400-foot head), and then gradually closes with dash-pot mechanism. The generator—a Dick, Kerr, 5,000 k.v.a. machine made in Preston, Eng.—was tested under normal load conditions during the week of Dec. 6th to 11th, and showed ample ability to meet all the conditions for which it was designed.

British Columbia Electric Railway Extensions—Barely Keep Pace with the Western Province's Requirements

By H. M. Lloyd

This has been a busy year for the British Columbia Electric Railway Company, owing to the demands for increased service in all departments consequent upon the rapid growth of the city and district.

At the generating plant of the Vancouver Power Company on the North Arm of Burrard Inlet, 16 miles distant, a new 10,500 h.p. unit is being installed which brings the capacity of the station up to 32,500 h.p. The generator is a three phase, 60 cycle, 2200 volt, revolving field machine, made by Dick, Kerr & Company, and is direct connected to four Doble wheels, manufactured by the John McDougall Caledonia Iron Works, of Montreal. Six Canadian General Electric air cooled transformers, of 2,500 k.w. each, are being installed in the transformer house, to raise the voltage to 36,000 for transmission to the various substations. The switchboards are of Westinghouse make, and a set of high tension oil switches and bus-bars, in concrete compartments, is being installed, to control the four transmission lines, these being made by the Kelman Oil Switch Company, of Los Angeles. These switches are a departure from former practice in design, and have met with considerable success on many of the high voltage lines in the Western States.

Type of Highway Crossing on Interurban Line.

To provide for this extension a new 7 foot steel pipe is being run from the dam to the power house, and the water tunnel which runs through the mountains between Lakes Buntzen and Coquitlam is being enlarged. The dam at the outlet of the latter lake is being raised 60 feet to provide increased storage during the low water season. The transmission system is being extended to Port Moody, Westminster Junction and Lake Coquitlam. The whole is being reinsulated with O. B. Co. 45,000 volt porcelain insulators, and the voltage raised from 20,000 volts, "delta," to 34,600 volts "Y," to increase the load capacity. In this connection, all the old ram's horn air break switches are being replaced with Kelman oil break switches, which will be automatic on all branch lines, so as to prevent trouble on one line spreading to the others. The line is also being extended from New Westminster along the route of the Fraser Valley railway extension, to feed four new substations, and supply power for commercial as well as railway purposes.

Extensions to substation equipment include the building of four new stations for the Fraser Valley extension.

contracts for building and apparatus having been let and the work well under way, and a 300 k.w. portable station. A second 2,000 k.w. rotary is being installed at Vancouver, and additions made to equipment of other stations. Plans are now being prepared for a new substation on the Lulu Island branch.

Railway extensions include about 14 miles in the suburbs of Vancouver, half of which is double track; two miles at North Vancouver; and work is being started on seven miles of line in Burnaby municipality, which will form part of a second interurban line to New Westminster. The branch of the C.P.R. from New Westminster to Eburne, about 9 miles, has been electrified, through cars being run over this line from Vancouver to New Westminster. The old interurban line has been regraded and double tracked for half the distance from Vancouver, and a new line is being made to avoid an excessive grade at New Westminster, which will, when completed, give a maximum grade of 2.7 per cent. on this line, where there have been grades as high as 11 per cent. heretofore. In carrying out this work some extensive cutting and filling was necessary, including two long trestles, which are being filled as material is available, and several concrete bridges over highways.

To provide rolling stock for all these new lines has taxed the car building shops to their limit, and a second extension to the shops in New Westminster is now being rushed to completion, and a new storage barn is being built at Vancouver. Among the cars built at the shops during the year may be mentioned 20 double track city passenger cars, 14 of these being pay-as-you-enter cars; two locomotives, several standard flat and box cars for freight service, and two handsome observation cars, similar to the ones in use in Montreal. Five new semi-convertible pay-as-you-enter cars are being built by the Brill Company, and other purchases include a large number of standard freight cars, both box and flats, and three 50 ton steel locomotives made by Dick, Kerr & Company.

Electric Locomotive Hauling Ten Coaches

These locomotives are interesting in that they are the first locomotives of the articulated truck type to be used in Canada. They are equipped with standard Westinghouse brakes, multiple unit control, and are driven by four 160 h.p., 600 volt motors, which gives the machine a drawbar pull of 16,000 pounds, with maximum momentary pull of 25,000 pounds, and a speed of about 25 miles per hour on level track. Two trolleys are used in multiple when heavy loads are to be moved. One of these locomotives has been in operation for about three months, and has done good work in every way. During the race meet this locomotive took a ten car train daily, carrying at times over 1,300 passengers on a trip. An idea of its capacity can be obtained from its having easily hauled a train load of lumber totalling over 400 tons, on a two per cent. grade.

In spite of the big programme of extensions suggested by the foregoing, the company has done little more than to meet the enormous demands made upon it in all departments by the growth of the territory it serves, and a big programme is being prepared for the coming year. It is expected that the 60 mile extension up the Fraser Valley will be completed in the spring, when the total mileage in operation will probably exceed that of any other electric system in Canada.

Trade Enquiries

The Dominion Government Trade and Commerce reports contain the following trade enquiries. Readers of the "Electrical News" may obtain the names of enquirers by writing us, enclosing stamped envelope and stating number of enquiry:

1523. Wolfram—A Liverpool company is prepared to receive samples and quotations from Canadian producers and shippers of wolfram.

1744. Agency—Inquiry is made on behalf of a firm manufacturing low pressure turbine plants, condensers, gas cleaning plants for utilizing blast furnace and coke oven gases; for the name of parties in Canada open to take up their Canadian agency.

1747. Representation—Inquiry is made on behalf of a firm having a specialty for the protection of electric overhead lines against atmospheric discharges, for the name of a Canadian firm of undoubted respectability to take up their representation in the Dominion.

1819. Electric light fittings, etc.—A London firm manufacturing electric light fittings, incandescent lamps, etc., wishes to get into touch with Canadian importers.

1823. Electric cranes, hand-cranes, etc.—A firm in the Midlands of England manufacturing electric cranes, hand-cranes, pulley blocks and overhead runways, is desirous of getting into touch with reliable parties in Canada having a good connection in these lines and open to take up their representation.

1853. Representative—A London firm manufacturing tungsten metal filament lamps, wishes to increase their business in Canada, and to appoint a representative.

1855. Electrical storage batteries—A Midlands company of electrical storage battery manufacturers would like to receive enquiries from Canadian firms requiring such goods, more particularly those suitable for private installations of 25 and 50 volts metal filament lamps.

1856. Agent—A London company manufacturing a special electric arc lamp, and other accessories, would like to secure the services of a competent resident agent to introduce their goods.

Norway abounds in waterfalls, the water supply being quite constant throughout the year, partly owing to the high altitude of the water sources and the condition of the climate, with the exceptionally high rainfall. It is estimated that the total water power of Norway amounts to about 7,500,000 h.p., giving 3,405 h.p. per 1,000 inhabitants of the country.

Low Head Hydro-Electric Development on Tippicanoe River at Monticello, Ind.—A description of a fair-sized water power development under the unusually low head of 8 feet. The Tippicanoe river is about 316 feet wide and would have an average depth, if unobstructed, of 3 feet. The installation consists of four 50-inch Leffel vertical turbine wheels, all driving on one main shaft, each with individual clutch and each rated at 115 h.p.—Electrical World, Oct. 21.

Street Railway Department

The Application of Storage Batteries to the Regulation of Fluctuation Loads

By E. B. Walker

(Concluded)

Unlike the differential booster, this system depends for its operation on a direct increase in the generator load, but the effect of this increase is so magnified by the carbon piles that the full regulating capacity of the battery can be utilized with a maximum fluctuation in the generator load of about 2 per cent. either way. Another feature of this type of regulator is that the sensitiveness of regulation may be adjusted so that the battery will accumulate charge without discharging, and vice versa. This is accomplished by means of two adjustable rheostats inserted in series with the circuits X-R^1 and Z-R. By adding resistance to the circuit X R F y the proportionate pull on the armature A will have to be increased before the battery will give its full discharge rate, thus the overload capacities of the generators can be utilized whenever necessary, and the battery will accumulate charge without causing a continual overload, which would be inevitable if some form of field regulation were used.

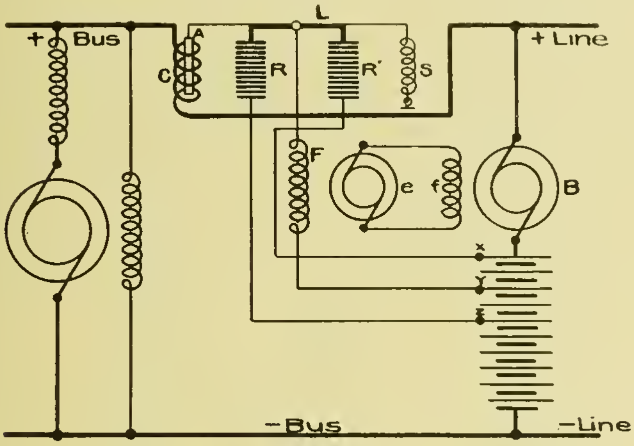


Fig. 6

Carbon Regulator Booster

In small plants where the exciting current for the booster is small, the exciter may be dispensed with and the regulator made to work with the booster field f instead of the exciter field F.

Although the exciting current from the battery through the regulator is very small, it is customary to use a T.P.D.T. switch, by means of which the leads xyz may be connected to the other half of the battery, and so equalize the discharge. The later types of regulators can be connected across the entire battery without the double throw switch.

Counter E.M.F. Booster

Another shunt regulating booster is sometimes used where the variation in the booster field is obtained by means of a small generator whose voltage opposes that of the main bus.

This type is shown in fig. 7. B is the booster armature, f the booster shunt field, C the armature of the C.E.M.F. generator or exciter, and F its field in series with the main bus. With normal load flowing through the field F, and exciter voltage is created equal and opposite to the bus voltage and, therefore, no current flows through the booster field f. With an increased load the exciter field F increases, strengthening its voltage sufficiently to overcome the bus voltage, and force a current through the booster field f, causing the battery to discharge. Similarly when the field F is weakened, the bus voltage will force current through the booster field f in the opposite direction and the battery will charge. The average generator load can be adjusted within certain limits by shunts connected across the exciter field F.

If a maximum fluctuation in the generator load of 10 per cent. in either direction is to be permitted, the voltage of the exciter C will fluctuate 10 per cent. from the normal, that is, only 10 per cent. of its kilowatt capacity will be utilized in regulation; it must, therefore, have a maximum capacity of ten times the energy necessary to fully excite the booster field f. Similarly, if a regulation of 5 per cent. is required, it must have a capacity of 20 times the energy required. From this it will be seen that the large size of the booster and its driving motor with the attendant loss of energy necessary to operate them, makes this type unsatisfactory for close regulation.

Constant Current Booster

The systems described above are mostly used in connection with railway and large isolated plants where there are widely varying loads. The isolated plant where power for elevators and lighting is furnished from the same generator also offers an important field for regulating batteries. Under these conditions it is essential that that lighting voltage be kept absolutely constant, but small variations in the power voltage are of little account. The type of booster used to accomplish this is known as the constant current booster (see fig. 8). With this constant current booster system, the lighting load is taken from the generator direct, and the elevator load from the battery. When no elevators are running the current through the booster armature B and series field F is at a minimum; the shunt field f is then stronger than the series field F and the booster adds sufficient voltage to the bus to charge the battery. When an elevator is started the increased demand for current through the booster strengthens the field F and reverses the

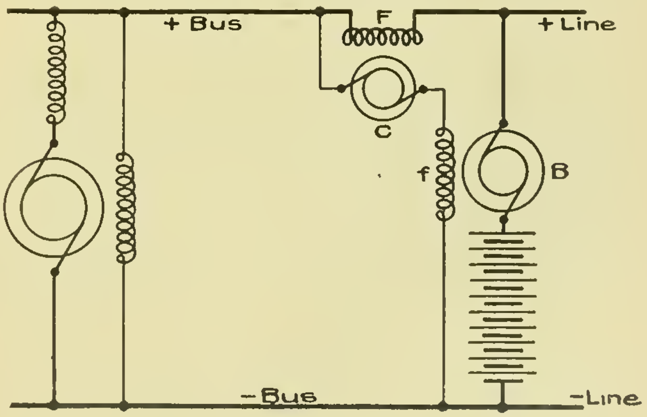


Fig. 7.

Counter E. M. F. Booster.

booster voltage so that the E.M.F. of the power bus will drop sufficiently to allow the battery to take the main portion of the load. To enable this booster to operate, it is necessary that the load on the generator from the power bus shall vary somewhat, although this variation is, of course, kept within a limit sufficiently small to prevent any fluctuations in the lighting bus voltage. By varying the strength of the shunt field f the battery may be made to accumulate charge or to carry the peak load. In either case the current supplied to the power bus from the lighting bus through the booster, is approximately constant and equal to the average demands of the battery and elevators.

The constant current booster will work satisfactorily even under the most severe starting current required by the elevators. The self induction of the series field F under sudden increased loads prevents an undue portion of the demand from falling on the lighting bus. Where constant potential is required at the power bus, a differential or carbon regulator booster is generally used but these types are rather more expensive than the constant current.

Methods of Driving Boosters

Boosters may be either belt driven, or direct connected to a motor; the latter method is in every way the most satisfactory. Where a regulating booster is used, working ordinarily under the limits of voltage required for regulation only, the high voltage at the end of charge is often obtained by connecting the motor leads across the battery instead of the bus, thus increasing the speed of the booster set in proportion to the battery voltage and raising the booster voltage. Where batteries are operated in connection with rotary sub-stations the boosters are very often driven by induction motors which give very satisfactory results.

The theoretical operation of all the above systems is based on straight characteristics for batteries, boosters, and motors, and the effect of curved characteristics is cumulative; in designing the boosters and motors it is therefore necessary to work at a low field saturation. With properly designed booster sets and a battery about two-thirds charged, the characteristics of the system is so nearly straight that it amply satisfies all practical requirements and any drop in the battery voltage caused by continuous discharge is easily compensated for by a slight adjustment of the booster field rheostat.

Regulating on Alternating Current Systems

To keep pace with the increase in the use of alternating current, systems have been devised whereby the adaptability of storage batteries for regulating purposes can be used to advantage without undue complication of apparatus. These systems may be briefly classified under three headings:—

(1) The supply is A.C., but distribution and load fluctuations are on both A.C. and D.C. sides of the system.

(2) The supply system is A.C., but the distribution is D.C.

(3) Supply and distribution A.C. only.

Under the first heading we have such systems as railways operating from rotary substations or motor generator sets. Here the situation is similar to an ordinary D.C. plant, and a battery and booster may be used in the same way.

Another class of plants which come under this heading are small installations where cranes or elevators are operated from a motor generator set. If this set does not supply current for other purposes, a very simple and inexpensive regulator can be easily applied. The battery is connected in parallel across the brushes and shunt field of the generator, and the series field, which is differentially wound, is connected between one brush and the external load. With no load on the line the generator shunt field rheostat is so adjusted that the battery will charge. With an average external load, the current through the series field depresses the generator voltage until it equals the floating voltage of the battery (2.08 per cell) and the power is supplied by the generator only, the battery neither discharging or charging. As the load increases the current through the series field increases and the generator voltage is further depressed, allowing the battery to discharge. By this means the load on the generator is kept practically constant, and although the line voltage varies somewhat, this variation is not sufficient to interfere with the satisfactory operation of motors for intermittent service and variable speed.

Under heading two, there are many modern distribution systems where there is a large A.C. motor load and also a D.C. railway load; and a satisfactory regulating system should take care of the maximum combined fluctuation from both classes of service. Such a system can be easily arranged by adding a storage battery to the D.C. end of the system, and connecting the booster so that its controlling device is operated by the alterations in current in the main A.C. supply, regardless of whether the power is required by the D.C. or A.C. service. Either the carbon regulator or C.E.M.F. booster can be used. With the former the regulating lever is controlled by an A.C. solenoid supplied from a current transformer in the main circuit, and with the latter the exciter field is supplied in the same way, but the current from the transformer is first rectified by a synchronously driven commutator.

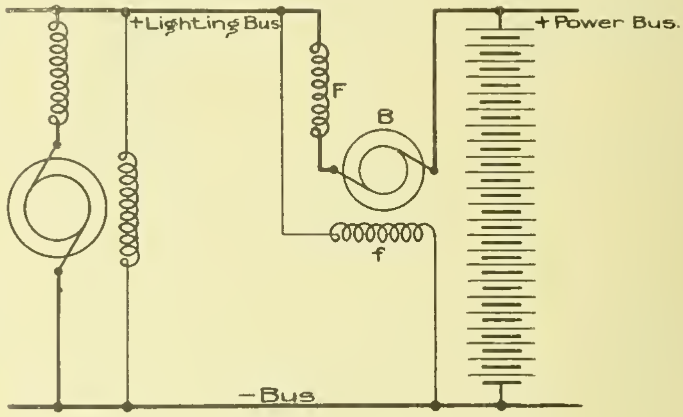


Fig. 8.

Constant Current Booster

With both these systems the element of time lag is very important, and with improperly designed apparatus it is possible, when the A.C. fluctuations are rapid, to have the battery charging on top of a heavy overload instead of discharging.

The possibility of trouble from this source depends chiefly on three conditions:

1. (a) Time element of the regulator.
   (b) Whether the fluctuations are small enough to be absorbed by reducing the D.C. demands, or whether they are so large that the battery must feed back into the A.C. system.
   (c) Inertia of the rotating machinery changing A.C. to D.C.

2. (a) As regulation is effected by a change in the field strength of the booster, the time taken to build up this field is an important item, and for quick regulation laminated cores are preferable. With the carbon regulator it is also possible to subject the fields momentarily to an exciting current of three times normal, which enables the booster to follow the variations with great rapidity.

   With any booster depending on a series field for regulation, the self induction of this field must always introduce a time lag of more or less importance.

   (b) In a system where the D.C. load is subject to the greatest variation, it is possible to regulate by merely relieving the A.C. line of a sufficient portion of the D.C. load by making the battery carry whatever portion may be necessary. But where the D.C. load is small and the A.C. variations large, it may be necessary for the battery to carry the whole D.C. load and at the same time discharge back into the A.C. system.

   (c) Wherever this is necessary the time lag characteristics of the rotating machinery are very important. In the case of an induction motor generator set, the rotor must be speeded from 2 or 3 per cent. below synchronism to a similar percentage above, and the rapidity of regulation will depend on the inertia of the rotor and armature.

   In the case of a synchronous motor generator set, the speed is not changed, but the phase position of the rotor is shifted, requiring a certain amount of time, depending on the inertia of the rotor and armature.

   In the case of the rotary converter, this inertia feature is very greatly reduced and consequently wherever rapid regulation is desired the rotary is much to be preferred.

3. Under the third heading are those plants where supply and distribution are both A.C., and where there is a fluctuating load of sufficient magnitude to demand some form of regulation. It is obvious that regulation could be obtained by installing a rotary, booster, exciter, carbon regulator and battery and controlling the regulator from the main A.C. circuit. This method is, however, complicated unless D.C. current is required, and is also not very efficient from an A.C. standpoint, as the losses in the rotary, booster set, exciter set, and battery must all be deducted from the net battery output. To overcome these drawbacks a special split pole rotary has been developed which has a variable voltage ratio controlled by the distribution of the field flux.

The theory of the action of this rotary has been so fully discussed in the current electrical journals that it will not be considered here. It is sufficient to say that each pole is split into three and the distribution of the flux over the three smaller poles is controlled by an auxiliary winding supplied by a small exciter. By this means the rotary can be made to have a D.C. voltage above or below normal, while the A.C. voltage is unchanged, and it is evident that a battery connected across this rotary will charge and discharge according to its change in voltage. As the auxiliary winding can be easily controlled by a carbon regulator, this equipment makes a very satisfactory method of A.C. regulation.

Recent Trade Publications

Evershed's Electrical Instruments—A catalogue distributed by Vandeleur & Nichols, dealing with switchboard patterns of ampere, volt and watt meters, including a special form of edgewise instrument. A complete list of prices is appended. A large stock of apparatus is carried in Toronto for immediate delivery.

The Westinghouse Series-Multiple Arc Lamps — A description with photograph and line drawings of an arc lamp for either outdoor or indoor illumination, manufactured by the Westinghouse Company. They are run two in series on a 220-250 volt circuit, or five in series on a 500-550 volt circuit. The best results are obtained when adjusted for 80 volts at the arc.

Westinghouse Turbo-Generator Sets—A very complete description of the development of the steam turbine for power service leading up to present day efficient productions of this firm. Well illustrated. A striking point brought out is the relatively small space occupied by the generators. The various construction parts of this machine are shown in sketches and fully explained.

The Mission of the Westinghouse Electric Stove Toaster—As told by itself. The toaster's duties are legion and always efficiently and promptly performed.

Transformers for Lighting and Small Motor Service—A catalogue issued by Allis-Chalmers-Bullock, Limited, explaining various kinds of small transformers to be used in lighting or small motor service. The transformers are made in 16 different sizes, ranging from 6-10 k.w. to 50 k.w. The construction is fully explained by line drawings.

Electrical Machinery—Issued by Bruce, Peebles & Company, Limited, and distributed by Vandeleur & Nichols. A description of induction motors, continuous current motors, alternators, dynamos, converters, turbo-alternators, traction motors, traction controllers, etc. Illustrated throughout.

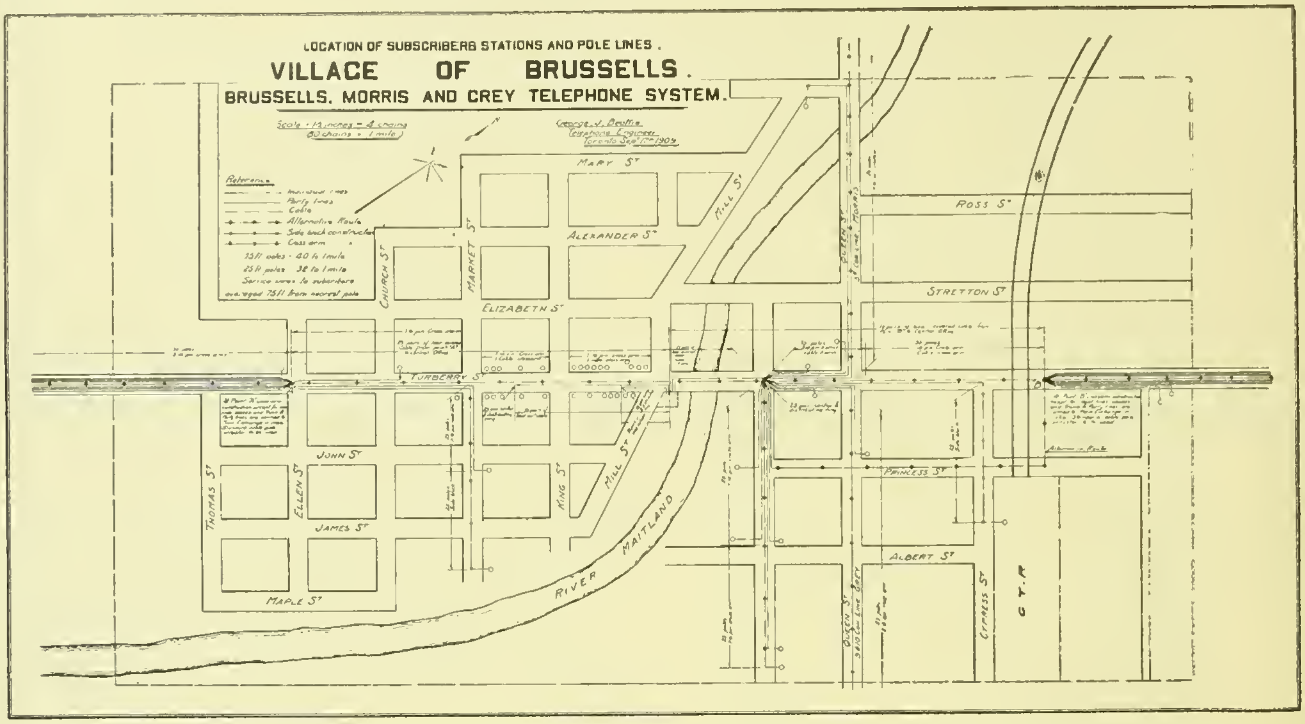
Peebles Motor Converters—A semi-treatise on the state of modern motor converter design and construction. The principle of the converter is explained and modern substation practice compared with that of a few years ago. Illustrated with photographs and line drawings. This catalogue is issued by Vandeleur & Nichols.

Need for More Efficient Lamps

Of the coal used in electric light power plants during the year 1908 in the United States not more than one fifth of 1 per cent. of the heat was actually converted into light, the remaining 99⅘ per cent. being consumed in warming the atmosphere and in various preliminary transformation of energy. The tantalum and tungsten lamps, respectively one and one-half and two and eight-tenths times as efficient as the carbon, have a significant bearing on the problem of conservation.

A new method of house wiring has been invented by Mr. Sarsfield Martyn, A.M., I.E.E., which, it is claimed, will reduce the cost by about one-half. His method is extremely simple, and obviates all chance of danger from leakage. When joining up the wires they are simply placed between two metal discs, and by one turn of the screw the discs are clamped together, making a fast connection. The discs are insulated from one another, and any number of wires can be connected by simply using more of them.

TELEPHONE TOPICS



The Brussels, Morris and Grey Telephone System

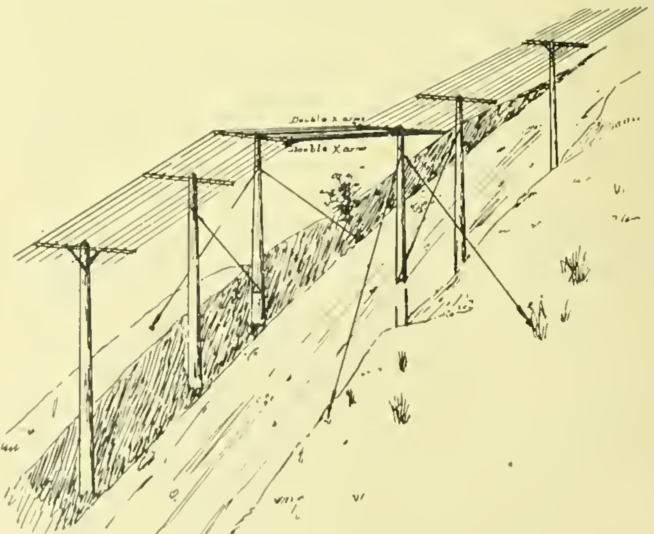
George J. Beattie

Construction work was commenced about two months ago on what promises to be one of the largest rural telephone systems in Ontario. The Brussels, Morris & Grey Telephone Company, for which this telephone system is being constructed, is, as its name implies, owned and operated by the municipalities interested, under the recent Act passed by the Ontario Government. No great difficulty was experienced by the organizers in securing subscribers, as practically all residents in the districts reached appreciated the advantages to be derived from a telephone system. In the spring of the present year application was made to the municipal council for permission to proceed with the organization of a telephone system, and a commission was appointed, of which Mr. F. S. Scott is president and Mr. John Leckie secretary-treasurer. To the indefatigable efforts of this commission is due in a large measure the success that has been achieved.

A reference to any map of the townships of Morris and Grey will show that the village of Brussels is practically in the centre, and, in consequence, it is here that the central office is located. In the organization and construction of this telephone system, every detail was carefully planned, close estimates of the cost of construction were made out, and a by-law of the necessary issue of debentures was passed by the council and approved by the Ontario Railway and Municipal Board. Detailed plans of the proposed work, together with the necessary specifications covering labor and material, were also drawn up, so that the contractors could figure on the work.

As noted above, Brussels is in the centre of the district it is feeding, in fact is on the boundary line between the two townships. It is therefore in an ideal location for the central office of this large system. The boundary line runs almost due north and south, and the main lead of the pole lines is located along the road that follows this line, from whence it feeds off to the various concession lines, a feed wire leading down every concession in the neighborhood of Brussels. The height and size of poles, the number and size of crossarms (or sometimes side-block construction is used), were shown on the prepared plan, so that the contractor had no difficulty in estimating on the work, or in carrying it to satisfactory completion.

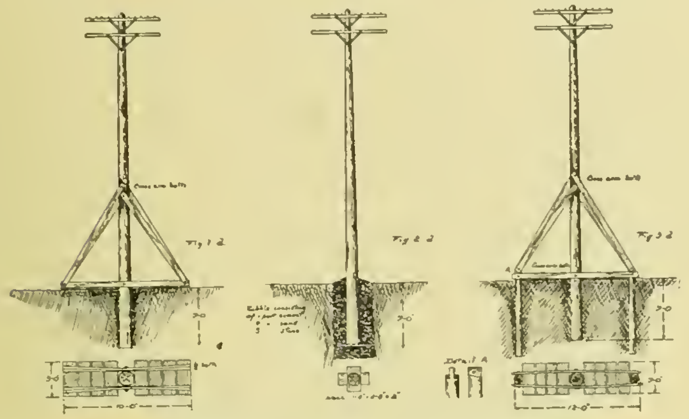
In the townships, party lines are used exclusively, but are limited to twelve telephones on a line, and in most cases there is a considerably smaller number than this. The telephones are of the bridging type and are



Crossing the Highway.

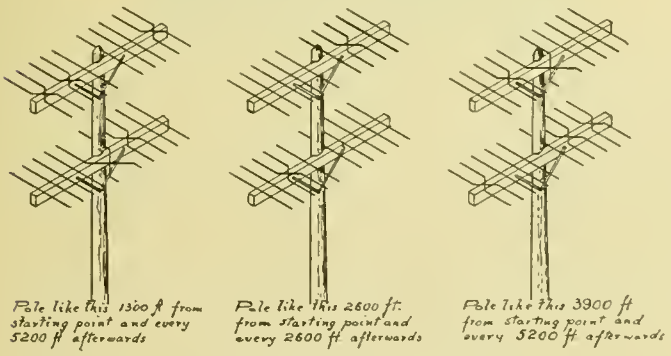
equipped with the "non-interfering" push button for calling central without ringing the bells of other subscribers on the same line. They are also equipped with "sure ring" condensers, by means of which it is possible to ring every telephone bell on the line if one or all receivers are off the hook.

In the village of Brussells they are practically all individual lines, using a telephone of the series type. It was here that the greatest difficulty was experienced in construction. On each side of Turnberry street, on which both main leads were brought in, there were magnificent rows of shade trees. In addition to this, the Bell Telephone Company's lines were on one side and the local Electric Light Company's wires on the other. It was therefore decided that all wires should be brought into the village in paper insulated lead covered cable right from the limits of the municipality. Lead cables were also run to each of the business blocks and terminated on a Cook pole terminal. The location of the central office and cable lines is shown on the drawing of the village of Brussels. The Brussels, Morris & Grey Telephone System decided to locate their central office in a building of their own, so that they are permanently located.



Solid Foundations in Soggy Places.

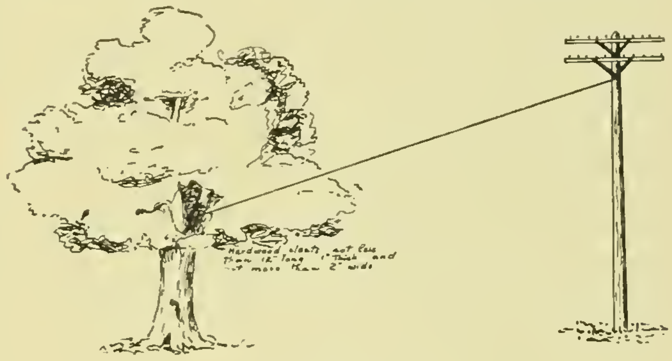
The switchboard, as at present installed, has a capacity of 150 lines, with 105 installed, of which 30 are party lines and the balance individual subscriber lines. It is also arranged so that additional operators' positions can be installed as required, and is equipped with the most modern type of self-restoring Gravity drops and automatically "Clearing-out" drops in the cord circuits. In the general construction work detailed drawings were shown of the various methods of line guying, transpositions, "tying in," etc., so that the work should be done in the best possible manner. One of these drawings is reproduced, showing the plan of guying where a road is crossed, also a diagram showing plan of transpositions.


Pole like this 1300 ft from starting point and every 5200 ft afterwards
Pole like this 2600 ft. from starting point and every 2600 ft afterwards
Pole like this 3900 ft from starting point and every 5200 ft afterwards

Transpositions at Regular Intervals.

All details of construction not covered by drawings were included in the general specifications, which were very carefully drawn up so as to leave, if possible, no loopholes for cheap or flimsy construction. The line guying and construction specifications were given very special attention and will not be surpassed by any in the country. All joints in galvanized iron wire are made with Cook sleeves or are carefully soldered. Special attention was also given to lightning protection, by the erection of lightning rods at suitable points, in addition to the regular form of protection at subscribers' stations and central office. It is also proposed to place shunt arresters on the main leads to further safeguard against lightning.

In the specifications for material only the highest grade of material was used. A great deal of cheap galvanized iron wire is used in this country which will eventually prove very expensive, as the galvanizing is poor and the resistance very high. John Roeblings & Sons' Extra Best Galvanized Telephone Wire was used throughout and while the initial expense was slightly higher, very little wire trouble may be expected for many years to come. The same high grade of material is being used throughout and together with the approved methods of construction being used, this system will, we believe, be one of the best constructed telephone plants in Canada.


Hardwood cleats not less than 12" long 1" thick and not more than 2" wide

A Wise Guy.

The entire telephone equipment was supplied by the Stromberg-Carlson Telephone Manufacturing Company.

British Trade in Canada

In a pamphlet entitled "British Trade in Canada," which has just been published in England, the following reference to the trade in electrical goods appears: "In their adaptability to being able to make electrical goods successfully the United States has the largest share of the import trade. The market for England in finished goods is not a very hopeful one, but a substantial trade can be looked for in various electrical accessories, cables, insulators, and a variety of similar lines. The main demand for electrical goods is, of course, in traction street cars, etc., motive power for plants, etc., telephones, and lighting. The British maker should find a wider trade with ordinary attention to the market. Remember, expeditious delivery means eliminating the Atlantic voyage, because your American and Canadian competitor is on the spot."

Roughly speaking, for each 100 k.w. in power house capacity which the direct-current system requires, the single phase systems require about 180 k.w. and the three phase system about 70 k.w.

QUESTIONS AND ANSWERS

Q.—Will you kindly inform me what causes the singing noise in a motor or generator? My opinion is that it is due to the friction of the surrounding air and I would like to know if I am correct?

A.—The friction of the surrounding air is responsible for some of the noise. Changes in magnetic conditions and vibration also add much to the hum.

Q.—Kindly give me the answers to the following questions: What is the temperature of the glower of a nernst lamp? What is the temperature of the filament of a tungsten lamp? What is the temperature of the electric arc? What is the temperature of the mercury vapor arc?

A.—The temperature of the nernst glower is stated to be between 2200 deg. C. and 2450 deg. C. The temperature of the filament of the tungsten lamp is approximately 1850 deg. C. The carbon filament of the ordinary incandescent lamp has a temperature about 1600 deg. C. The arc between the two electrodes of the open arc lamp has a temperature of 3500 deg. C. The temperature of the mercury vapor lamp varies. In one case the figures given are as follows: Temperature at the anode, 148 deg. C.; temperature at the cathode, 164 deg. C., and the temperature midway between the cathode and anode is stated to be 164 deg. C. The data given are, of course, only approximate and for ordinary conditions of operation

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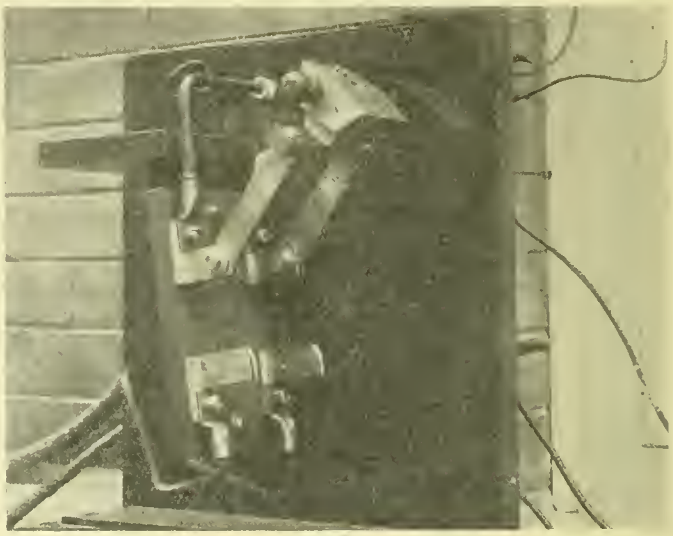
Q.—(a) Will you kindly explain the method by which the opening of the Royal Edward Institute at Montreal, for the care of tuberculosis, was accomplished by King Edward. Was the switch at Montreal which closed the motor circuit actuated through relays connected to the circuit the King completed or closed on a signal over the cable? (b) I have always understood that cablegrams were read from flashes of light. If this is correct, I would like to know whether it is because the cable will not carry enough current to actuate a relay or because the inductive lag would cause the operation to be too slow?

A.—(a) The opening of this institute in Montreal was performed by His Majesty King Edward VII, from Chichester, England, through the medium of a direct connection between the two points, arranged for by Lt.-Col. Burland, the donor of the hospital. A through cable telegraph service was made use of in carrying out this project. On the land lines in Canada automatic telegraph repeaters were placed at St. John, N.B., and in the main office in Montreal, therefore when the King completed the circuit at Chichester, by closing the knife switch provided, the automatic signal was repeated from point to point until it finally actuated the instrument placed at the institute. This latter instrument was so weighted. Included in the power circuit were motors to release the catch on the doors and throw them open, the it released a catch and closed the power circuit. This switch, as may be observed in the accompanying cut, is arranged that on being actuated by an electric current lighting system and a motor for winding up the flag rope and to raise the flag to the top of the pole. The King kept the circuit completed until he received a despatch from Montreal stating that his signal had been received. The return message advising the King of the completion of the circuit closed by him was transmitted by another route, and was handled by operators at Canso, N.S., and Waterville, Ireland. From information since received it develops that the actual time elapsing between the time the King pressed the signal until he received a return message from Canada was less than one minute. While the circuit connecting Chichester and Montreal did not consist of one metallic connection, yet the arrangements were automatic in their entirety and necessitated no assistance from the operators of the company or other human hands.

(b) Cablegrams were formerly transmitted through the medium of a moving pencil of light, but this method has now become obsolete and the cable companies now use a system whereby the message is transmitted either by handworking keys or a transmitter which sends signals according to punctures in a paper tape. At the receiving end, instead of the old flashlight system, they use a moving strip of paper, on which a line is traced by a rapidly vibrating glass syphon. The incoming signals cause the syphon to move from one side to another, producing a wavy line, the length of the waves above or below a zero mark determining the letters of the message. A cable repeater for automatically retransmitting signals from one section of cable to the other is now in use by the various cable companies. It was this instrument that was used at Canso, N.S., to retransmit the signals from the cable into the land lines. The mechanism of this instrument is exceedingly delicate and it becomes a correspondingly expensive instrument for the cable companies to maintain. In place of the glass syphon used to transmit the cable messages to the paper, on the receiving end, there is a very delicately constructed arm, the contact point of which rests on the surface of a revolving cylinder. This cylinder is divided into three sections, the centre section is exceedingly narrow and is insulated from the other two sections. Normally a contact point rests on this centre section, but when the signal is transmitted, the contact point moves either to one side or the other, and by connecting the contact point through a battery to the transmitter for the land line system and back to both sides of the outside section of cylinder, the land line of the transmitter is actuated when the contact point varies from the zero section. The actual current used in transmitting modern cablegrams is very small. In fact, the battery current has no actual metallic connection, but actuates it through a condenser There are several reasons for not using heavy current in transmitting cable messages. First among these, there is the risk of destroying the cable


The Weighted Switch with which King Edward VII opened the Royal Edward Institute at Montreal

Personal Mention

Mr. W. McLea Walbank.

The death of Mr. W. McLea Walbank, first vice-president of the Montreal Light, Heat & Power Company, came as a shock to his many friends and acquaintances throughout the Dominion. Mr. Walbank was a Newfoundlander, having been born in St. Johns, in 1856, but his early engineering education was obtained in Queen's University, Galway, Ireland, where he spent two years. Later he entered McGill, graduated with the degress of applied science in 1877, was admitted as a Provincial Land Surveyor for Quebec in 1878, was a member of the Land Surveyors' board of examiners for several years, during which time, and up to the present, he was a practicing engineer, surveyor and architect in the city of Montreal.

Like all men of his type, Mr. Walbank was best known by his good work, and among the larger installations carried to a successful issue by the deceased may be mentioned,—the incline railway at Mount Royal; the stone bridge over the Muskrat river at Pembroke; the sewerage system of the town of St. Gabriel; the sewerage system of Montreal West, and the hydro-electric plant at Lachine Rapids. Of the latter system, Mr. Walbank was managing director until it was merged, in 1903, with the Montreal company, of which he then became vice-president and chief engineer.

The late W. McLea Walbank

At the time of his death Mr. Walbank also had in charge the Soulanges hydro-electric plant, repairs to the Chambly and St. Therese dams, and the construction of a large office building in Montreal.

The deceased was married in 1888 to Miss Richards, daughter of the Hon. Wm. Richards, of Prince Edward Island, who survives him, with three sons, the eldest of whom bears the same name as his late father.

Mr. John Passmore, who has been employed as engineer and electrician at the Stratford power house, has resigned his position and intends to dispose of his property there, with the intention of purchasing the electric light plant in Hensall. Mr. Passmore has been in the employ of the works for over five years, and will be greatly missed by the works and his fellow workmen.

D. G. Sturrock, Toronto manager of the C. P. R. Telegraph Company, has gone to Portland, Ore., for his health.

W. E. Skinner, of Winnipeg, is acting as supervising engineer in connection with the new lighting installation in Fort Frances.

Legal Decisions

Abbott v. Trenton—An agreement between the town of Trenton and defendant company providing for the sale of certain water power privileges, and also a by-law authorizing the making of said agreement, were set aside as invalid under Con. Mun. Act, s. 565 (4), as the by-law had not been submitted to the ratepayers and it was not competent of the corporation to sell their interest in said water privileges or to enter into a contract to sell the same without that being done. An injunction was granted restraining defendant company from erecting the works contemplated by the agreement, as they had not received the assent of the electors as required by 9 Edw. VII., c. 75, s. 2 (1).

Mazza v. Port Arthur—Defendants held liable for damages to plaintiff, for injuries received while attempting to alight from a car, through the negligence of defendants' servants in causing the car to start with a sharp jerk, which threw plaintiff to the ground.

Horrigan v. Port Athur—Appeal from an injunction restraining the council of a municipality from executing a contract with a company for supplying electrical power to the municipality and from attaching the corporate seal thereto, on the ground that the by-law submitted under the Act of 1906 was invalid, because it did not publish the estimates and the contract so as to enable the voters to judge of that on which they were asked to vote; that the submission was not within sec. 11 of the Act of 1909, because it was not, and was not intended to be, a general submission of the question, but had relations to the Act of 1906; and the submission of the by-law and contract was illegal for the want of proper publication; that there was, in fact, no proper submission under sec. 533, and therefore sec. 11 of the Act of 1909 could not be invoked to support the by-law; that the council had no right to enter into the proposed contract. Held, that the appeal should be dismissed and the injunction should go to the hearing. Judgment of Clute, J. (1909), 14 O.W.R. 973, affirmed.

Dossert & Company, New York, manufacturers of solderless connectors, state that their Mr. Smith has been successful in increasing the sales of Dossert connectors in Canada, and that the past year has been the most prosperous in the history of the company, witnessing many improvements in the appliances and a marked expansion in the field of their usefulness.

In a recent wreck in which a Pennsylvania steel car, equipped with tungsten lamps, left the rails and was tipped over, not one of the lamps suffered injury.

Current Literature

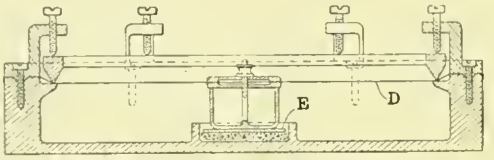
Water Powers in Europe. T. Koehn.—An article on the quantity of water power available in the principal European countries. The following interesting table is appended:

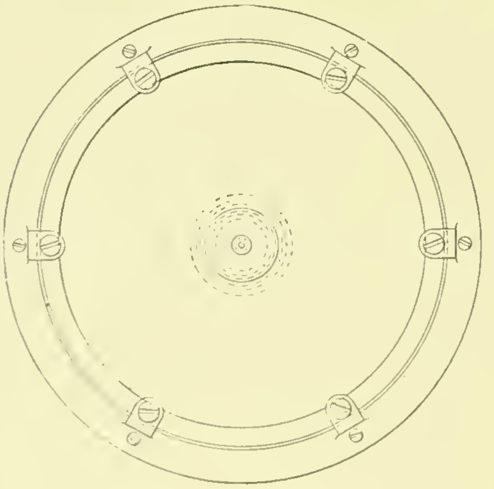
	Total h.p.
Great Britain	963,000
Germany	1,425,900
Switzerland	1,500,000
Italy	5,500,000
France	5,857,000
Austria and Hungary	6,460,000
Sweden	6,750,000
Norway	7,500,000

—Electrical Zeit., Sept. 23.

Telephone Trials With Lond Distance Microphone, by C. Egner and J. G. Holmstrom—A description of tests undertaken in Europe with a new microphone which, as regards strength, surpasses, by far, all similar existing instruments and can further be used for large currents without undergoing any change.

Laboratory tests showed that the energy available in this microphone as compared with others of standard manufacture was, amperes about 4 times, volts about 4 times, and, therefore, watts about 16 times. Distance tests made with wires 4.5 mm. in diameter, having a total length of 2,130 miles, showed that the speech produced by the high current instrument was very distinct, whereas nothing could be heard from the ordinary microphone.





The principle upon which the instrument is based is that the diaphragm is so clamped that there can be no doubt that the point of greatest vibration is exactly at the centre, and the front disc of the microphone (which is not in this instrument formed by the diaphragm itself) is so fixed to the diaphragm that its entire surface moves with this maximum amplitude. This arrangement is indicated in the figure. The method of clamping the diaphragm D with an additional clamping ring is clearly shown, as is also the attachment of the front disc E of the microphone, which, it is seen, is devised in such a manner that the movement of the ends of the disc is the same as that of the centre. Electrician, Nov. 19.

Electrically Operated Cog-wheel Railway, Montreux-Glion, Switzerland, by Frank Koester—A description of a two-mile cog-wheel electric railway running from Glion down to Montreux, which is a central point for tourists and the altitude of which is 1,300 feet above sea level. The average grade on this road is 105 feet in 1,000, while the steepest grade is 130 feet in 1,000. Elec. Review, Nov. 27.

A Damped Quadrant Electrometer for Submarine Cable Testing, by R. M. Sayers—The author describes a modified Dolezalek quadrant electrometer, which he has found very useful in testing laid submarine cables. The method of using the instrument is given in detail, supplemented by comparative tests made with the galvanometer and the electrometer.

Telephone Time, by John Grant—A scheme whereby the telephone exchange contracts to supply its customers with clocks which are guaranteed to be absolutely correct. The system is controlled by one master clock, of first class quality. This is a pendulum clock equipped with a device which makes a contact once a minute and thus sends out current to operate other clocks on the same circuit. Twenty clocks have been operated on one line.—Telephony.

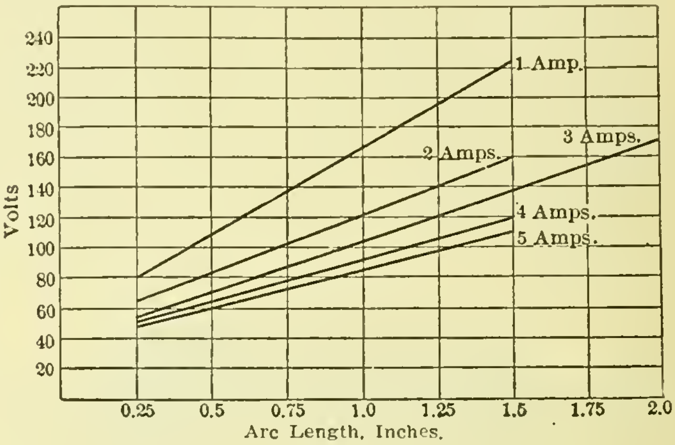


Fig. 1

The Titanium Arc, William S. Weedon—A description of the efficiency of titanium carbide as arc electrodes. To give the best results the titanium carbide electrode should be the cathode and placed below an anode of copper which does not waste appreciably. Curves are shown indicating the relation between (a) arc length, volts and amperes (fig. 1), and (b) arc length, amperes and power consumption (fig. 2). The latter curve indicates a very efficient arc. The titanium lamp is essentially for street lighting, the horizontal illumination being large compared with carbon arcs.—Elec. Review, Nov. 27.

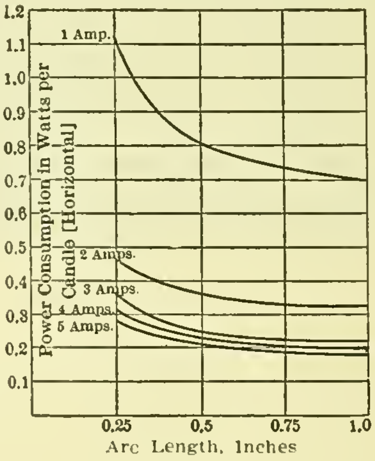


Fig. 2

Utilization of Energy of Niagara Falls.—An article dealing with the number of horse power developed by each of the seven operating companies at Niagara Falls and the uses to which the power is put. The total development of each company it stated as follows:

	h.p.
International Railway Company	1,200
Electrical Development Company	35,000
Canadian Niagara Power Company	
Niagara Falls Power Company (2)	122,240
Ontario Power Company	58,700
Niagara Falls Hydro-Electric Power & Mfg. Company	59,000
	276,140

Total available is calculated at 5,000,000 h.p.—Electrical World, Oct. 21.

Current News and Notes

Aylmer, Ont.

The Town Council has decided to rebuild its water and light plant, destroyed in the explosion six weeks ago, and will instal steam-driven machinery, as before.

Arnprior, Ont.

The Galetta Electric Power Company is now supplying the town of Arnprior with light. An abundance of power is at hand for industrial purposes. The power is rated at 1,800 h.p., developed under a 28 foot head on the Mississippi river.

Burnaby, B.C.

The British Columbia Electric Railway Company has asked the town council that it be allowed the option to build an electric railway north of Burnaby Lake for the purpose of opening up a new district.

Brandon, Man.

Messrs. E. J. Gifford and H. J. Skynner again made application to the city council for a franchise for the establishment of a heating plant, also for a street railway, and power and light plant.

Brandon received a most welcome addition to its industries and conveniences recently when the Brandon Gas and Power Company started to manufacture gas, which, during the evening, was supplied to several business houses and blocks.

Brantford, Ont.

Mr. J. S. Clark on his own behalf and that of Mr. H. C. Zwetsch of Buffalo has made application for a franchise upon certain streets of Brantford. It is said the idea is to build a line from Port Dover to Owen Sound, passing through the chief intervening centres.

The Bell Telephone Company is extending its rural lines to Ohsweken, the progressive Indian now demanding telephone connection. The list will start with some twelve subscribers. The Waterous Engine Works Company is installing a private exchange of 27 telephones. This is the first private exchange in Brantford.

The motion of Dennis Hogan to set aside the contract between the city and Western Counties Power Company has been dismissed. Under it the company must sell power for light and motive use in Brantford at a rate of 10 per cent. lower than that offered elsewhere by the hydro-electric commission, distance in the cost of transmission considered. The effect will be to put Brantford out of the municipal power union. The agreement is for five years.

Berlin, Ont.

The Railway Committee of the Board of Trade will renew negotiations with the G. T. R. on the question of the electrification of their Galt and Elmira branches.

Waterloo and Berlin have different opinions on the operation of the Berlin & Waterloo Street Railway Company. About one-fourth of the mileage is in the town of Waterloo and the town of Berlin, which owns the railway, asked Waterloo to assume a share of the cost of operating expenses. The latter town asks only to be allowed a share of the net profits. The Ontario Railway & Municipal Board will investigate the matter.

Brampton, Ont.

An agreement has been entered into by the Bell Telephone Company and the Chinguacousy Municipal Telephone system. The municipal system takes over the Bell lines in the township at a price of $2 200. They also agree to pay to the Bell $2 per subscriber per year. The Bell subscribers in Brampton will be connected with the subscribers of the municipal system without extra charge. The agreement is for three years. The Chinguacousy lines already erected suffered considerable damage by recent storms which delayed temporarily the operation of the line.

Belleville, Ont.

A by-law is being submitted to the people authorizing a lighting contract between the Trenton Electric & Water Company and the corporation of the city of Belleville. The agreement calls for 37 2,000 c.p. electric arc lights and 252 incandescents, the lamps to burn every night from sunset to half hour before sunrise. The price for arc lights to be $50 and for incandescents $10 a year. The company also agrees to light city buildings at 8 cents per kw. or at a flat rate of $2 for each 16 c.p. lamp and to supply citizens, on meter, at 10 cents per kw. with 20 per cent. discount.

Campbellford, Ont.

The water was turned into the power house of the Seymour Power & Electric Company a few days ago. Power will be distributed to Marmora, Delora, Madoc, Stirling and other points from this centre. Within the next few years several power plants will likely be in operation, all situated a few miles from this town.

Creston, B.C.

This town will probably be connected with Nelson by long distance line in the near future. Cranbrook and Nelson are each about 67 miles distant, but as the poles of the Creston Power, Light & Telephone Company already extend to Kootenay Landing, 18 miles on the way to Nelson, it is probable the latter place will get the connection.

Cornwall, Ont.

An agreement has been entered into between Cornwall Township and Cornwall Electric Street Railway Company, whereby the company receives a franchise to extend its railway up the West Front road over Wood's Hill to the Ontario & New York Railway depot.

Calgary, Alta.

The Alberta Government has installed an automatic telephone exchange at Calgary, Alta., with six hundred phones.

Mr. R. R. Jamieson, chairman of the board of the Calgary Street Railway Company, writes that the company now has 16.5 miles of street railway track in that city, on which 12 pay-as-you-enter cars are being operated, and that it is in the market for six more pay-as-you-enter cars of modern construction throughout, 46 feet 6 inches in length over all, equipped with air brakes, four 40 h.p. motors, etc.

Essex, Ont.

The Electric Lighting Plant with other business buildings were destroyed by fire recently. Total estimated loss, $50,000.

Edmonton, Alta.

A movement is one foot to provide for a board of three railways commissioners who will assume full management of the Edmonton Radial Railway. The idea is to place the street railway on a thorough business basis and remove it entirely from the control or influence of the city council.

Negotiations have been carried on for some time between this city and Strathcona looking to the construction of a high level bridge over the Saskatchewan river which would be used by an electric railway to connect the two centers. Owing to difficulties in the way of reaching a satisfactory agreement, Edmonton has now decided to go ahead and bear the whole expense of the bridge.

Eastview.

A by-law will be submitted in January to give the Ottawa Electric Company a 10-year franchise to operate in the village, the first five of which will be exclusive.

Fernie, B.C.

The civic power plant commenced operations on Saturday, November 27. This important event was made the occasion of a gathering of prominent citizens in the big dynamo room.

Fort George, B.C.

Mr. Clarke, manager of the Fort George Lumber & Navigation Company, stated that he intended to install an electric light plant and a small system of water works at South Fort George next spring.

Frank, Alta.

The Canadian-American Company is planning to install an electric power plant at its works in Frank. The plant will be driven by gas engines, the engines to be operated by waste gas from the coke ovens.

Fort Frances, Ont.

At present Fort Frances owns her own water works, sewers and electric lighting system, and now a movement is on foot looking to the acquisition of the telephone system.

The town of Fort Frances has employed W. E. Skinner as supervising engineer in connection with the installation of the municipal lighting system. The contract for arc lamps has been let to the Canadian Westinghouse Company; for transformers to the Allis-Chalmers-Bullock Company, and for meters to the Canadian General Electric Company. The plant will be ready for operation in January.

Fort William, Ont.

A bylaw is being submitted to raise $19,000 by way of debentures for improvements and extensions to the electric light system.

A by-law to raise $6,000 for the purchase of the Bell Telephone Company's system in this city is again before the people. Practically the same by-law was defeated by a large majority on July 14. F. R. Morris, the City Solicitor, has made a favorable report on the proposed agreement.

The ratepayers will be asked to vote on a bylaw to raise $21,000 for improvements to the telephone system.

Fredericton, N.B.

Representatives of the Provincial Government will urge before the Railway Commission the advisability of using electric motive power on the Grand Trunk Pacific Railway through New Brunswick. It is proposed that the power for the object be obtained by harnessing the Grand Falls on the St. John river.

Goderich, Ont.

It is said that the railway between Kincardine and Goderich is to be run with steam at first, though the charter calls for an electric road. It seems unlikely that the appliances for the generation of power on the Maitland river will be ready in time for the opening of the road.

A by-law is being submitted asking power to issue debentures to the amount of $15,000 to pay debts incurred in connection with the municipal waterworks and electric lighting systems.

Hamilton, Ont.

For the first time in its history serious trouble was caused at the generating plant of the Dominion Power & Transmission Company by the gathering of anchor ice in the forebay which prevented the water from passing down the penstocks. All the auxiliary plants were called into requisition and were handling the railway system in a few hours.

The Board of Works has decided to place 52 street lamps in the east end annex. The lights will be taken under the street lighting contract with the Cataract Power Company and will cost $2,300.

The city has closed a contract with the Hydro-Electric Commission for the supply of 1,000 h.p. The authorities have until December 31, 1910, to enter into an exclusive agreement.

Ingersoll, Ont.

The ratepayers of Ingersoll will vote on a by-law for a civic power distribution plant in January. It is estimated that the plant will cost $26,000.

Kingston, Ont.

Bylaws will be submitted to raise $30,000 for new gas generators, and $10,000 for electrical apparatus renewals.

An agreement has been reached between the city council and the Street Railway Company, who have accepted the terms offered some weeks ago by the Light, Heat & Power Committee. Mr. H. W. Richardson, president of the railway, signed a contract for five years to take power at 1.2 cents per kilowatt hour. The company agrees to issue working-men's tickets, good for the early hours in the morning and in the evening from 5 to 6.30, at 8 for 25 cents, and those for any hour at seven for 25 cents.

Lethbridge, Alta.

The street railway bylaw was defeated.

London, Ont.

It is probable that the Canadian Westinghouse Company, the lowest tenderers, will be awarded the contract for the power station equipment.

Manager King, of the London Street Railway Company, has agreed to a 10-cent fare to Springbank with stop-over privileges at the pumphouse. The company retains the theatre and amusement privileges at Springbank for seven years with option of renewal.

The formal transfer of the South Western Traction Company to the new company will not mean any change in the active management as Mr. S. B. Mower still retaines the position of manager and the remainder of the staff is unchanged. It is planned to spend $150,000 in the next few months, chiefly in improvements to the road bed.

There is a movement on foot having as its object the acquiring by the city of the plant of the London Electric Company, to be used as an auxiliary either for peak loads or in case of breakdown of the Niagara service. The Hydro Electric Commission, it is understood, disapproves the purchase on the ground that it is an unnecessary precaution.

The city council has placed the management of all Hydro-Electric matters in the hands of a Utilities Commission which will be appointed on January 1. Ald. Stewart reported that the power committee had spent to date $26,806.21.

The North Midland Railway scheme is said to have received the necessary financial support to commence operations in the early spring. It is proposed to connect London with Stratford, St. Mary's, Brussels, Goderich and later extend to Owen Sound.

The recommendation of Medical Health Officer Hutchinson, made at the recent meeting of the Board of Health, that all mouthpieces of public telephones be disinfected frequently, meets with the unanimous approval of London medical men.

The Canadian Westinghouse Company has been awarded the contract for the electrical apparatus for the municipal electric lighting system, amounting to $50,908. The total amount of the bid of the company was $64,058, which included one motor-generator set and street arc lighting system, awards for which have been deferred.

The City Council on December 1 ratified the agreement with the London Electric Light Company providing for a continuation of the street lighting at the old rate of 23 cents per lamp per night, until the municipal distribution plant is ready to light the streets with Niagara power next year. The agreement, however, provides that in case the city does not take the company's service for a full year that a sliding scale shall be paid according to the proportion of the year for which the company furnishes the service.

Ald. Stewart and Engineer Sifton are busily engaged tabulating the tenders for the power station equipment and underground work. The cost of the station equipment will run about $60,000. The underground will cost about $70,000.

The London & Lake Erie Railway & Transportation Company has been incorporated in Ontario with a capital of $2,000,000, to succeed and take over the Southwestern Traction Company. The new company will also acquire the Woodstock & Thames Valley Electric Railway and include same in its railway system, and in addition will build from Brantford through Paris to Woodstock, Ingersoll, London, Strathroy and Glencoe; from Delaware to Lambeth, and from Aylmer to St. Thomas. The company will also operate a line of boats between Cleveland, Ohio, and Port Stanley, Ont. Directors, W. K. Birge, Sidney Jones and Geo. B. Woods, Toronto, Ont.; F. G. Rumball and John Purdum, London; Angus Mackay, Ingersoll, Ont. and Albert E. Thompson, Cleveland, Ohio.

Mt. Forest, Ont.

The first annual meeting of the Mt. Forrest Wellington & Grey Telephone Company received the following statement:—The total receipts were $2,022.47, made up mainly of calls on stock, with $140 from rentals of 'phones and $34.07 for messages. A balance of $62.96 is on hand after all disbursements, including cost of construction of line. Last year's officers were re-elected.

Moncton, N.B.

Mr. H. S. Bell, who was appointed by the council as chairman of the Water & Lighting Commission at a salary of $1,800 on condition that he would devote his whole time to these duties, has resigned, as have also the Commissioners. A letter has been received from Jas. A. S. Henderson, president of the Moncton Electric Street Railway, Heat & Power Company, expressing his willingness to negotiate with the city for the purchase or lease of the city lighting and gas plants and it is probable the difficulty will find its solution in this way.

Miniota, Man.

Tenders are being called for the purchase of $12,000 20-year debentures at 4 per cent. for the purpose of completing the telephone system of this municipality.

Mission City, B.C.

The business of the Mission City Telephone Company, incorporated five years ago with $500 capitalization, has increased $3,000 in value. The plant and interests have now been acquired by the Mission City Telephone Company, Limited, incorporated with a capital of $10,000.

Montreal, Que.

The by-law submitted to the property holders on December 21st asking permission to spend $2,000,000 to establish a municipal lighting plant, carried by a majority of about 400. The vote polled was very small, about 3,000, or in the neighborhood of 15 per cent. of the total.

The Shawinigan Water & Power Company announces the issue of 5,000 shares of new common stock at par. This brings the common issue to $7,000,000. In addition there is an outstanding debenture stock issue of $2,000,000 and a bond issue of nearly $5,000,000.

The Montreal Water & Power Company have received notice from Secretary Seath of the Harbor Commissioners, asking the company to remove that part of the dyke at Verdun alleged to be in the limits of the river controlled by the commissioners.

At a recent meeting of the Westmount City Council the city attorney was instructed to take action to collect fines from the Montreal Street Railway for violation of contract in not maintaining a service such as is required by the agreement between Westmount and the company. According to this contract made in 1904, the M. S. R. is required to furnish a 2½ minute service on Greene avenue, Victoria, Sherbrooke and St. Catherine streets during the rush hours of the day. It was claimed that the intervals between cars range from 5 to 12 minutes at those hours. The Street Railway officials have promised that steps will be taken at once to see that the proper service is given.

At a cost of $1,000,000, the M. S. R. Company is about to commence the erection of a plant, consisting of car building shops, machine shops, electrical and winding shops, blacksmith and point shops, and a large building for the stores and material of the company. Work will commence inside of a few weeks.

Norwich.

A by-law will be submitted asking power to raise the necessary money to build a distributing station for the Hydro-Electric current supply.

New Westminster, B.C.

Another branch will shortly be added to the net work of electric lines radiating from this city, and surveyors are now at work running lines and preparing grades for an extension to Fraser Mills. It is expected that construction work will be commenced within a few weeks.

Providing the wet weather does not interfere too much with the work, the Cloverdale section of the Chilliwack tramline of the B. C. Electric Railway Company will be ready for operation by Christmas.

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of water rights of the Marquam river, to be utilized for power purposes, has been filed by C. T. Dunbar, of Vancouver, B.C. It is said that Mr. Dunbar proposes to organize a company to develop the water power to generate electricity.

Nelson, B.C.

Nelson has added a new 1,850 h.p. wheel and 12,000 volt generator to its lighting plant. The generator is the Allis-Chalmers-Bullock type, 1,000 kw., 3-phase, 60-cycle, 180 r.p.m.

The Bulls River Falls Power & Light Company, at present constructing a large power plant in the Fort Steel district, proposes to furnish electricity for lamps and motors to all towns in the Pass country from Michael and eastward to Moyie.

The directors of the Street Railway Company, Limited, have authorized the architect, A. Carrie, to call for tenders for the construction of a sub-station and a car barn. The sub-station will be constructed of concrete, stone, brick and iron. Dimensions 22 feet x 14 feet. Building will commence shortly.

Ottawa, Ont.

A by-law to extend the franchise of the Metropolitan Electric Company of Ottawa, Limited, for 25 years, may be submitted on condition that 1,000 horse-power be ready for delivery to city in three years from date of passage of by-law.

Mayor Hopewell has suggested that the municipality act as distributing agent for all the different companies supplying electric energy within the city limits. It is claimed this would be more economical and would prevent undue duplication of the unsightly pole.

A bill compelling all ships leaving Canadian ports to be equipped with wireless telegraphy has been introduced by Mr. Lewis and received its first reading.

The location survey has been completed for a distance of 18 miles in connection with the Ottawa-Morrisburg Electric Railroad.

The ratepayers of the township of Nepean will vote at the January municipal elections on the question of giving a franchise to the Metropolitan Electric Company to allow the company to run its lines through the township.

The Railway Commission at Ottawa, Ont., proposes to issue an order requiring all electric railways under its jurisdiction to install air brakes as well as hand brakes on their cars. The electric roads affected have been given an opportunity to be heard, the consideration of the matter being laid over for that purpose until February 4. Included in the list is the Montreal Park & Island Railway, the Ottawa Electric Railway, Hull Electric Railway and the Hamilton Radial.

The Hamilton, Waterloo & Guelph Railway Company, John Patterson, secretary, is applying to Parliament for an Act amending its charter by providing for an extension of the time for the completion of its railway and for power to extend its line from a point at or near the City of Hamilton to the City of Toronto, or, in the alternative, in part to enter into an agreement with the Hamilton Radial Electric Railway Company for a lease of or running powers over its line from the village of Burlington to Toronto.

A bill respecting the Montreal Central Terminal Company, introduced in the House by J. A. C. Ethier, M.P., asks to be authorized to enter into agreements with the Canadian Northern, Ottawa Valley, Boston and Maine, Intercolonial, Montreal Terminal, Montreal Suburban and Chateauguay & Northern Railways, to acquire the franchises, rights and properties of the Montreal Light, Heat & Power Company, the Saguenay and Canadian Light Companies, and to connect its telegraph and telephone lines with existing companies. The company shall commence its works and expend $500,000 within two years, and if they are not finished in seven, its powers will lapse. No list of incorporators is given.

Application is being made to Parliament for an act to incorporate "The International Waterways Canal & Construction Company," with power to construct a canal between the following points: (a) From Thunder Bay, on Lake Superior, or from Pigeon river to the Lake of the Woods; (b) thence to the Red river, or from the Lake of the Woods to a point on the Winnipeg river, and thence by the said river to Lake Winnipeg; (c) thence to Cross Lake, so as to create a navigable waterway to the head waters of the Saskatchewan river, and its branches, together with all subsidiary and necessary powers.

Application has been made to the Dominion Parliament for incorporation of the Ottawa, Rideau Valley & Brockville Railway Company, with power to construct and operate a railway by electricity or other motive power from the city of Ottawa to the town of Brockville; also to operate a ferry service across the St. Lawrence river from Brockville to Morristown, N.Y., and to build an extension of the main line from Ottawa to High Falls, in the Province of Quebec. Permission is also asked to develop water power, to be utilized to generate electricity for lamps, heat and motors. D. H. McLean, of Ottawa, is solicitor for the applicants.

Perth, Ont.

The town electric light management is putting in a new turbine wheel at the Ritchie water-power, which will give considerably more power, for lighting purposes. Mr. M. Stanley, of this town, through a company he represents, supplied the wheel.

Port Arthur, Ont.

The city's power supply is so short that lights have to be cut off at midnight on account of the low water in the Current river, due to the dry fall. The Kaministiquia Power Company will supply, temporarily, 800 h.p. to relieve the power and light stringency. The work of constructing the power line from Kakabeka Falls to the city and of building the transformer station will begin at once.

The ratepayers of the city will vote on the respective propositions of the Ontario Hydro-Electric Commission and the Ontario & Michigan Power Company at the municipal elections.

Prince Rupert.

The electric light plant was recently destroyed by fire and the only other power plant in the town is a 125 h.p. steam driven generator. Total loss, $60,000.

Peterborough, Ont.

The town is badly in need of power, as without it no sufficient inducement can be held out to manufacturing concerns. The Peterboro' Hydraulic Company offers to develope and deliver 1,000 h.p. at $20.

Quebec, Que.

Mr. Rodolphe Forget, who has had charge of all negotiations in connection with the merger of the public utilities companies of the city of Quebec, now included in the Quebec Railway, Light, Heat & Power Company, makes the following official statement: All negotiations are now completed, and the following companies will be included in the merger: The Quebec Railway, Light & Power Company, the Quebec Jacques Cartier Electric Company, the Canadian Electric Light Company, the Quebec Gas Company and the Frontenac Gas Company. The new company has an authorized capital of $10,000,000 of stock and $10,000,000 of bonds.

Regina, Sask.

The Government long distance telephone line to Arcola has been completed, and connection made with the Regina exchange. With one or two exceptions all the offices along the line report good business.

Rainy River, Ont.

The council has refused to renew the franchise of the Rainy River International Telephone Company until the ratepayers can be consulted as to whether the town shall take over the system.

Russell, Man.

The village of Russell, 500 inhabitants, is much exercised because the government after repeated requests, will not extend the long distance line from Binscarth, 13 miles.

Simcoe, Ont.

The Norfolk Telephone Company, by agreement with the Bell Company, has retired from Simcoe, while the latter company ceases to compete with the Independents in the remainder of the disputed territory—Port Dover, Waterford, Delhi, Otterville, etc.

Selkirk.

The town of Selkirk has engaged W. E. Skinner, Limited, as engineers to place a valuation on the Selkirk Electric Light & Power Company's plant, with a view to taking the plant over and operating it as a municipal enterprise.

Sheep Creek, B.C.

The advent of electric power to operate the mines and mills properly is near at hand, and the result will be, as estimated by competent engineers, an annual gold output from this camp of several million dollars.

Stratford, Ont.

The People's Railway by-law will not be submitted to the ratepayers in January.

This city will submit a by-law asking power to raise $105,800 for electric purposes, $53,800 being for the purchase of the electrical plant of the Stratford Gas Company and $47,000 for additional appliances necessary for distribution of Hydro-Electric power, for which delivery has been arranged with the Commission.

St. Thomas, Ont.

As soon as the specifications for the rotary convertors and transformers for the distributing station have been received, tenders will be called for.

The Street Railway Commissioners and a committee of the City Council have agreed to ask the ratepayers to vote $25,000 to improve the road and equipment and make extensions to the city's railway. There will be $15,000 spent on cars, $5,000 on roadbed, and $5,000 on extensions.

Sherbrooke, Que.

C. B. Hibbard, of Montreal, representing a company, has been granted a franchise of forty years, the city to have the privilege of purchasing at any time after twenty years. The estimated cost of the pro-

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posed extension is $526,500, and the company has two years in which to complete the work, which will be under the control of Messrs. Ross & Holgate, of Montreal.

Smith's Falls, Ont.

This town will vote on a bylaw to raise $16,000 to purchase the Adam Foster grist mill and water power adjoining, now leased to the corporation of Smith's Falls.

St. John, N.B.

The Board of Trade of St. John is discussing the supply of cheap power in that city by the establishment of a generating plant at Mispec. About 15,000 h.p. can be developed.

Saskatoon, Sask.

The Saskatchewan Power Company have offered to supply the city with power at less than $30 per h.p. per annum for a twenty-four hour day. The following schedule of lighting rates has been adopted: From 1 to 100 kw., 11 cents per kw.; from 101 to 150 kw., 9 cents; from 151 kw. up, 8 cents, with a 10 per cent. discount if accounts are paid within 10 days.

St. Catharines, Ont.

The Crocker-Wheeler Company has decided to locate their Canadian branch here; their headquarters are at Ampere, N.J. The firm manufactures electrical machinery. One contract on hand is for $250,000 in connection with Winnipeg's big power works. Machinery will be made here and it will be necessary to greatly enlarge the factory building purchased from the city. The company has agreed to start with one hundred first class mechanics, but say they will be employing a thousand within a few years. The Canadian office, which has been in Montreal, will be moved to St. Catharines.

Everything is in readiness for the laying of the steel on the Port Colborne extension of the Niagara, St. Catharines & Toronto Railway. It was feared that a delay would be caused because of the impossibility of making transportation arrangements for the delivery of the rails from Sault Ste. Marie to Port Colborne. A Canadian Northern steamer, however, was secured and the steel brought to Midland, where it was trans-shipped to G. T. R. cars for Port Colborne, where it will be delivered in the course of a day or two. The consignment of steel, consisting of 700 tons of rails, arrived from Sault Ste. Marie and will be used on the extension between Welland and Port Colborne.

Terra, Alta.

J. A. Martin will establish an electric plant and is having plans prepared for a power house.

Thorold, Ont.

The Board of Trade has passed a resolution in favor of a bylaw granting equal privileges, in this town, to the Ontario Power Company, the Canadian Niagara Power Company and the Cataract Power Company.

Trenton, Ont.

Chief Justice Mulock has given judgment restraining the town of Trenton, without first getting the consent of the ratepayers, from leasing to the Trenton Electric & Water Company surplus water from a dam on the River Trent constructed for navigation purposes.

Toronto, Ont.

The assessment department places the value of the Toronto Street Railway's two storage battery systems at $100,000.

Representatives of Toronto township, Burlington, Milton, Port Credit and Mimico, recently waited on the Hydro-Electric Power Commission to discuss power matters. They intend to take power from the Commission, and it is understood that they were told they could obtain a supply on the same terms as other municipalities.

A new private branch exchange system is being installed in the Robert Simpson Company's departmental store, consisting of a 4-position board, 50 trunk lines to the Bell Company's central office and 150 substations. This is probably the largest private branch exchange in any mercantile house in Canada.

In all probability hydro-electric legislation will be dealt with at the coming session of the Ontario Assembly providing for an equitable and final method of disposing of disputes and differences which arise in the securing of right of way for the building of transmission lines.

Application has been made at Ottawa for the incorporation of a company that purposes building an electric railway from Port Hope to Toronto, passing through Newcastle, Bowmanville, Oshawa, and Whitby, with branches to Uxbridge, Lindsay and Peterboro, and also stub lines south to Lake Ontario. The capital of the new company is stated to be $1,000,000, the major part of which is Oshawa money. The names on the application include Dr. T. E. Kaiser, W. F. Cowan, and Robert McLaughlin, of Oshawa; Frank Robson and J. H. Downey, of Whitby, and Ralph R. Mowbray, of Kinsale.

Victoria, B.C.

The cable steamer Restorer is laying a cable for the British Columbia Telephone Company from Telegraph Bay to San Juan Island to replace that broken during the recent storm.

The new wireless station at Ikeda Head, Queen Charlotte Islands, is in working order and has been a complete success. C. P. Edwards, Dominion Superintendent of Wireless Stations, has fixed the location for the Prince Rupert station on Digby Island.

The B. C. Electric Railway Company will double track their lines on Douglas street, beginning on January 7th.

The Vancouver Island Power Company, Limited, will construct a dam and storage reservoir on Bear Creek and Alligator Creek respectively, tributaries of the Jordan river, on Vancouver Island; build a power house and install generating apparatus, and build transmission lines to the city of Victoria, 30 miles distant, and to surrounding districts. The power is intended chiefly for use by the B. C. Electric Railway Company, which operates the street railway in this city, but the quantity to be generated will be largely in excess of the requirements of this company. Turbines will probably be of the Pelton impulse type. Already the plans and specifications for the electrical and other mechanical apparatus have been prepared and forwarded to the leading manufacturers in this country as well as England and the United States. This machinery will cost up into the hundreds of thousands of dollars. The machinery will be ready in ample time for installation when the preliminary work of erecting the power house, etc., is completed.

We are advised by J. H. Smith, 1122 Government street, Canadian manager, Ellsworth Company, that tenders for the erection of the steel tower for wireless communications have not been awarded. He gives as additional reference his headquarters, 475 Arcade Annex, Seattle, Wash.

Vancouver, B.C.

A new unit, which will mean an increase of 10,500 horse power for the B. C. Electric Railway, has just been installed at Lake Buntzen, and is now in partial operation. The total horse power which the company now has available reaches over 32,000.

The Dominion Wire Manufacturing Company have recently made arrangements to establish an office in Vancouver.

As the result of a recent fatal accident to a lineman, Charles Peace, the coronor's jury made the following recommendation: "We recommend that the civic authorities take immediate steps to have the overhead wiring throughout the city inspected to prevent similar occurrences." The evidence went to show that the wire which caused Pearce's death had been hanging over the sidewalk for some time.

By the failure on November 25 of the third conducting cable of the British Columbia Telephone Company with Vancouver Island communication is severed with the mainland, except through the Canadian Pacific.

Additional switchboard accommodation is to be installed at its Vancouver central exchange by the British Columbia Telephone Company. The new section of board will have capacity for over 2,000 telephones and bring the total capacity of the exchange up to over 10,000 telephones. It is expected that the new board will be ready for service by the end of the year. It is also the intention of the company to lay another cable between the mainland and Victoria. This work is to be carried out early next year. Mr. George H. Halse, manager of the company, states that the telephone increase has lately been at the rate of 350 per month. Business in Vancouver has grown with remarkable rapidity, the company during the present year having strung no less than 700,000 feet of wire and erected 1,500 poles. The company will also build a new direct line to Seattle.

The B. C. Electric Railway Company has just produced from its New Westminster shops a new fender known as the Jordan Automatic fender, which the municipal authorities will be shortly asked to inspect. It has a cradle at the front which is tripped to fall to the ground whenever an obstruction appears and a second fender or life-gaurd is placed directly before the wheels.

The B. C. E. Company was given an order for lighting the municipality of South Vancouver which will involve the installation of 150 arc lights.

The Brooks-Scanlon Lumber Company is contemplating replacing the steam donkey engines with electrical power for logging on its property at Gordon Pasha Lakes, near the head water of Jarvis Inlet. It is said that the company proposes to erect a power plant on Powell river. It is expected that logging by electricity will soon become general throughout British Columbia.

General Manager Sperling of the British Columbia Electric Company, on returning from England announced that the directors had passed six million dollars appropriation for expenditures in British Columbia. One large work to be immediately undertaken will be the erection of a steam auxiliary plant in Vancouver. A steam plant for generating twenty thousand horse-power will be erected immediately.

The British Columbia Electric Railway Company have placed an order for 50 car fenders of the Watson type.

Waterloo, Ont.

Plans have been submitted to the council for the new power house by Engineer Moogk.

The Waterloo Board of Trade recently passed the following resolution: "That in the opinion of the Board of Trade no exclusive franchise should ever again be granted to any Telephone Company, and that the Council be requested to grant a franchise to the Can. Machine Telephone Company, should they apply for one.

Wingham, Ont.

Last week at Goderich what is to be known as the Goderich Rural Telephone Company was provisionally organized. This company expects to operate lines in Colborne, Ashfield, East and West Wawanosh, Hullett and Goderich townships. Huron county will have her full share of rural telephone lines, with companies operating out of Goderich, Wingham, Clinton, Seaforth, Zurich, Brussels, Wroxeter and Gorrie. The North Huron Telephone Company has had a very successful season. The first telephone on this company's lines was in operation on the 1st of September and now there are sixty subscribers on the lines, with connection at Belmore, Bluevale, Belgrave, Whitechurch and St. Augustine. Many new lines will be built next season and before many years nearly all the farmers in this district will have telephones.

Woodstock, Ont.

A contract has been let to the Canadian General Electric Company, of Peterboro, for machinery at a cost of $20,000, which is necessary in turning the local plant from a steam to an electric power plant. Electric current from the Falls is expected to be on hand here some time during the coming year.

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Welland, Ont.

The extension of the N. S. & T. Radial Railway to Port Colborne is being rapidly pushed to completion. The reported further extension to Fort Erie is not an immediate probability.

The promoters of a new electric railway may apply for a charter to the Ontario legislature. The idea is to construct a road from the Falls through Welland to Dunnville, with branches.

Winnipeg, Man.

St. Boniface and St. Norbert residents are agitating for an extension of the Winnipeg Street Railway along both sides of the river to accommodate a district south of the city of Winnipeg which is peopled largely by market gardeners, milkmen, etc., whose trips into the city are necessarily frequent.

The steam plant of the Winnipeg Electric Railway Company proved quite inadequate for the recent demands made on it. The capacity is only about 8,000 h. p., only part of which could be generated on account of the plant being out of repair. The city's requirements are as high as 20,000 h.p.

AWARDED.

Hamilton, Ont.

We are officially informed that the contract for the supply of low voltage motors for the Beach pumping house has been awarded to Canadian Westinghouse Company, and that for two 5,000,000 gallon pumps to McDougall Company, Traders Bank Building, Toronto. The purchase of two transformers at a cost of $4,000 is necessitated.

Montreal, Que.

It is stated that the Canadian Light & Power Company has contracted with J. G. White & Company, New York, for the construction of a hydro-electric plant on the St. Lawrence river, near St. Timothee, Que. The plant will utilize the Beauharnois canal water, giving an available and constant head of 50 feet. The power station will contain three 7,200 horse-power turbine units coupled to 4,000 kilowatt generators and have space for a fourth unit; also two 400 horse-power exciter units and switchgear; the 27 mile transmission line to Montreal and substation and distributing system at that city will also be included in the contract, which is estimated to cost about $4,000,000.

Toronto, Ont.

The Board of Works has awarded the contract for the supply of copper wire for electrical purposes to the Canadian General Electric Company, Limited, at 16 1-10 cents per pound. Others tendered as follows: 16 35-100 cents and 16-11 cents.

The following contracts have been awarded by the Hydro-Electric Commission. For steel boilers for heating the transformer stations at Niagara Falls and Toronto, to the John Inglis Company, Limited, Toronto, $515; two steel boilers for heating the stations at Dundas and London, E. Leonard & Sons, London, England, $511; cast iron boilers for heating the stations at Guelph and Preston, Taylor, Forbes Company, Guelph, $498; cast iron boilers for heating at Berlin, Stratford, St. Mary's and St. Thomas, Gurney Foundry Company, Toronto, $592. Tenders have been awarded for 12,000 volt conductor cable to Siemens Brothers' Dynamo Works, England, for $21,149, installed. The tender of the same firm has been accepted for submarine cable for $1,943.12, and for underground cable for $1556. The contracts all come within the estimates.

CANADIAN RIGHTS FOR SALE

The advertiser wishes to dispose of the Canadian rights of an "Electric Lamp Cord Adjuster", in which a patent has been granted by the Canadian Government. This adjuster is on the list of approved fittings in United States and Canada. For full particulars address George C. Allan, 50 Burnside Ave., Crawford, N. J., U. S. A. 1

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European manufacturers of arc lamps, carbons and electrodes are desirous of establishing a Canadian agency. Correspondence invited from reliable firms. Address Box 880 Electrical News, Toronto, Canada. 2

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One A.C. 50 K.W., S.K.C. Generator, 2 phase, 3 wire per phase, 120-240 volts, 66 cycles. In perfect running order, complete with exciter, rheostats, spare bearing and coils. Will be sold cheap to prompt buyer. Apply Vankleek Hill Electric Co., Limited, Vankleek Hill, Ont. 2

Wanted

Mechanical Superintendent for large manufactory and repair shop. Must have executive ability and especial knowledge of electrical apparatus, motors, transformers, meters, etc. Good prospects. Apply, Mechanical Superintendent, P. O. Box 2396, Montreal, with references, stating experience. 1

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THOS C IRVING,
Gen. Man. Western Canada, Toronto

A New Departure

In this issue of the "Electrical News" will be found the advertisement of the Cameron Lumber Company, Limited, informing the public that they are prepared to supply telephone, telegraph and electrical power line cross-arms in any sizes and quantities required by the trade. This is a new industry established in British Columbia, and merits the support of all Canadian users of cross-arms.

The Cameron Lumber Company, Limited, have for some time operated their lumber mills at the city of Victoria, B.C., but it is only a few months since they decided to go into the business of making the cross-arms of Douglas fir, which is considered as good for that purpose as any known wood. They now have installed at their plant automatic boring and shaping machines, the most complete and perfect devised for the purpose, enabling them to turn out about a carload of the cross-arms per day.

From the best information we have, practically all the cross-arms being used in western Canada have been and are being supplied by manufacturers in the United States. We bespeak for the Messrs. Cameron the liberal patronage which their enterprise in the establishment of this new department in the manufacture of Canadian raw material so fully merits.

Low Pressure Steam Turbines

This form of turbine seems now to be coming into extensive use as an auxiliary in railway and other power plants. The philosophy of the use of this device is very simple. Working steam at high expansions is known to be necessary to economy. If this is attempted by multiple-expansion engines much better results can be obtained than with an ordinary compound engine, but as a mechanical fact the low-pressure cylinder of a triple-expansion engine is somewhat clumsy and owing to its great bulk offers considerable added friction. Now the use of a low-pressure turbine in connection with a compound engine merely transfers to the turbine the function that otherwise might be fulfilled by a third or fourth low-pressure cylinder. The turbine, having less friction, is more efficient than the added cylinder for expansion, and also having a higher rotative speed is far less bulky and inconvenient. Its higher speed leads to a lower generator cost, so that by adding a low-pressure turbine unit to a compound engine and coupling it merely electrically, there is secured at once advantage in space, advantage in efficiency and advantage in generator cost. Installing such a turbine merely converts a compound engine into a triple-expansion engine of particularly good working properties, and to judge from most recent report the result in economy is just about the same, with great mechanical advantage added in case of working under a highly variable load. There is some additional gain thereto from the fact that with the introduction of the steam turbine has come the use of higher vacua than used to be customary, so that with the improved apparatus now available there has come also improvement in practice and results.

Recent reports that the Brooks-Scanlon Lumber Company are installing a system of logging by electricity are premature. To date there is no machine built for the purpose, and until some electrical expert designs a donkey that will operate by electricity instead of by steam no such change can be made.

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Subscribers are requested to promptly notify the publishers of failure or delay in delivery of paper.

EDITOR'S ANNOUNCEMENT.

Correspondence is invited upon all topics coming legitimately within the scope of this journal.

Vol. 19 Toronto, February, 1910 No. 2

The Economy of Low Voltage Tungsten Lamps

Tungsten lamps, with their consumption of 1¼ watts per candle power, should exactly meet the needs of the small consumer. On this basis, an 8 c.p. lamp operates with 10 watts, a 10 c.p. lamp with 12½ watts, and a 16 c.p. lamp with 20 watts. If current costs 10 cents per k.w.h., the actual running cost of an 8 c.p. lamp is a tenth of a cent per hour, and of a 16 c.p. one-fifth of a cent an hour.

The total cost, including the original cost of lamp, is rather difficult as yet to determine, owing to the varied life of tungstens. This life has been shown under favorable conditions to run over 3,000 hours, and present indications are that the near future will show the average life of tungstens well up to that of carbons. Placing the life even at 500 hours, and the cost at 70 cents, both, we believe, conservative estimates, the cost of a 16 c.p. lamp per hour works out as follows:

Cost of lamp per hour of life	.14 cents
Cost of current per hour	.20 cents
Total cost per hour	.34 cents

In proportion as the life of the lamp lengthens, this total cost will, of course, decrease. 1,000 hours will reduce the total of a 16 c.p. lamp to .27 cents per hour; 2,000 hours to .23 cents, etc. With low voltage lamps using larger filaments the chance of breakage is considerably lessened and the life correspondingly prolonged. Take the case of 100-104 volt circuits already fitted with carbon lamps. Under these conditions either 25 volt or 31 volt tungstens could be utilized in series. A danger to be avoided is increase in current. If, however, these lamps consume only 1¼ watts per candle power, the 25 volt tungsten requires .8 amperes and the 34 volt lamp slightly less than .6 amperes. The latter could plainly be used without danger of overloading the lines. If 8 candle powers are used, the 25 volt type would be perfectly safe using only .4 amperes. A 10 c.p. 25 volt set would use the exact .5 ampere.

The Low Pressure Steam Turbine

This type of turbine, a natural sequence to the high pressure turbine, is bein glargely used in the United States but has not as yet made progress in Canada. The reason for this is not easy to see, since in the matter of economy the past two or three years' experience has shown operating results entirely in favor of the low pressure turbine for the use of exhaust steam, even where satisfactory working condensers are in use.

The value of low pressure steam is perhaps underestimated. Roughly speaking, one-half the energy is lost if steam is discarded at atmospheric pressure, i.e., no more power is given by expansion from about 200 pounds pressure down to atmosphere than by the further expansion from atmosphere down to a fair vacuum. Recent experiments carried out in a typical plant in the United States showed that 30 pounds weight of steam working between 180 pounds pressure and atmosphere would deliver one k.w. of energy, while the same weight of steam working on a low pressure turbine between atmosphere and 29 inches of vacuum delivered another k.w. This is probably 50 per cent. more than the most economically working condenser can be depended on to produce.

The importance of these facts to the central station operator who is nearing his limit of capacity is evident. The writer has in mind a small station lighting equipment of approximately 200 h.p. generator, with boiler capacity of perhaps twice that amount. A threatened overload has been prevented for the time being by the introduction of tungsten lamps, but a vigorous campaign in sign or window decoration might soon tax the plant once more to its limit. With the low pressure turbine to replace the condenser a second respite is assured.

Rural Telephone Progress

The present age may almost be described as the telephone age so universally has this luxury of a decade ago become an absolute essential to the man who makes any attempt to keep in touch with present day conditions. Nowhere is this more true than in the rural districts and smaller towns, where the condition of isolation has always done so much to retard progress and, worse still, created that sort of narrow provincialism which blinded the eyes of these districts to the need of progress. That this defect is being rapidly remedied the expansion of the Bell business throughout the sections of Canada it serves, the rapid extension of lines in the western provinces, where the Governments are in control, and the constantly increasing numbers of independent lines from one end of Canada to the other, give ample testimony. We believe, however, that in the rural districts many enthusiastic telephone organizations die in embryo for need of a little assistance or encouragement or from sheer lack of knowledge of the ordinary methods of procedure. To such we commend the article of Dr. Doan, which we print in this issue, dealing with the organization of his own company and giving many valuable hints and warnings against the pitfalls by the way. Dr. Doan is one of the most widely known and best posted telephone men in Canada and as president of the Independent Telephone Association is certain to do much for the extension of the telephone's usefulness.

High Pressure Direct Current Transmission

An article in this number by a writer most competent to deal with the subject of direct current transmission but who, for personal reasons, wishes to remain anonymous, contains much information that our readers will find of interest. Comparatively little has been done in this direction in Canada, but at the present time we understand the new management at Quebec is considering direct current transmission as one of the alternatives in the electrification of a branch of their system. In our last issue a descriptive article outlined the results, not altogether favorable, of a 2,750 d.c. transmission line in England. Much greater prominence, however, has been given these installations on the European continent, and especially in Switzerland, where Thury, a Swiss engineer, has made a life study and practice of d.c. generation and transmission. As early as 1889 a 75 mile circuit at 14,000 volts pressure was installed at St. Aquedotto de Ferrari-Galliers. Three years later, at St. Maurice-Lausanne, a 70 mile line at 27,000 volts, was put into successful operation, followed in 1906 by a 60,000 volt 225 mile line at Montiers Lyons. In the latter station the voltage per single generator is 7,200. Since that date new installations have taken more or less the form of experiments, complete results of which have not been available.

Work Begins at Port Arthur

The last obstacle has apparently been removed from the path of the municipal control advocates in Port Arthur, and the agreement has been signed between the city and the Hydro-Electric Power Commission. Work on the transmission line will begin at once.

The source of power is the Kaministiquia Power Company of Kakabeka Falls, who already transmit current to Fort William by a double set of three wire, 60 cycles, 25,000 volt lines. The plan of the Hydro-Electric Commission is to tap these high tension wires at a point about seven miles from Port Arthur. The current will be transmitted from this point by two separate wooden pole lines, placed a mile or so apart, as a factor of safety in obtaining a continuous service, and stepped down at Port Arthur to 2,200 volts. A transforming station will be built immediately, planned for 5,000 h.p. ultimate capacity and with present capacity of 2,000 h.p.

The plant of the Kaministiquia Power Company, 20 miles from the city of Fort William, will have an ultimate capacity of 30,000 h.p., and has a present capacity of 15,000 h.p. It has been calculated that 100,000 h.p. could be developed at this point.

The Power Minister at Ottawa

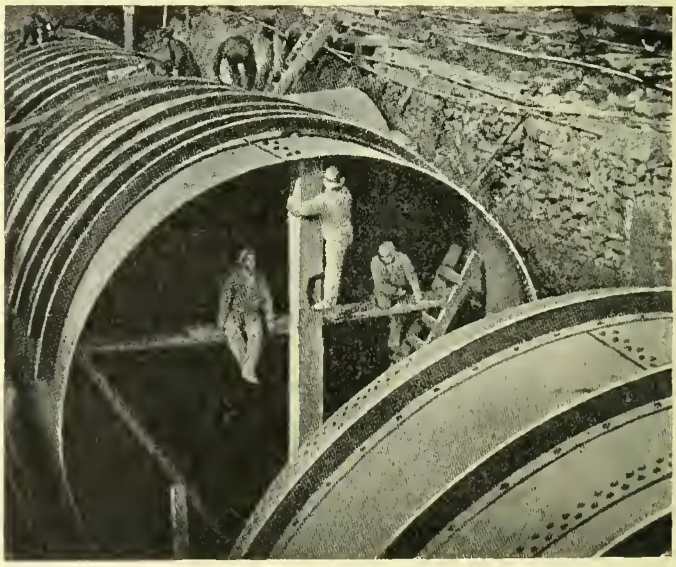
At the recent meeting in Ottawa of the National Commission on Conservation of Natural Resources, the Hon. Adam Beck explained the scheme of electric distribution being carried on by the Ontario Government and outlined the plans of the Hydro-Electric Commission for the future. It is the hope of the Government at no distant date to extend their operations west to Windsor and east to Kingston, power for the eastern section being obtained either from the Trent Valley or the St. Lawrence. The power in Ontario will probably be ready for use by the middle of 1910 and the various municipalities will be served in the order in which their own installations are completed.

The speaker expressed the hope and belief that the work so initiated in his own province would be carried forward by the national commission in all the departments of our national heritage.

The Hon. Clifford Sifton, president of the commission, in his opening address strongly favored the development of electric smelting plants. He estimated the possible power developments of Canada at 16,696,279 h.p., of which 511,890 h.p. had been developed. Referring to Ontario's power policy, the speaker said that it is now open to serious question if the time has not arrived when all water power development should be under the control of the governments concerned, requiring a license for development, being subject to general laws and yielding a share of the profits for the public treasury.

Ontario Power Company Extensions

The year 1910 promises to be one of rapid extensions for the Ontario Power Company, of Niagara Falls, Ont. General Greene, the vice-president of the company, when seen by the "Electrical News" a few days ago, outlined the programme for the coming year, which includes the immediate installation of a second 18 foot conduit tube, and incidentally rock excavations for the third and final tube. The recently installed 12,500 k.w. generator, making seven in all, is entirely satisfactory, and plans are well advanced for another unit. The filling in of the windows overlooking the river, where the water entered a year ago and damaged the generators, is nearly completed and no more trouble from that source will be possible. With the new conduit tube installed, power up to about 150,000 horse power will be available. The conducting wires for the supply of energy to the Hydro Electric Power Commission of Ontario will be carried in underground conduit to the generating station of the commission and delivered at 12,000 volts.



18 Foot Tube being Duplicated by the Ontario Power Company at Niagara Falls, Ontario.

The Calculation of Transmission Lines

A Comprehensive Review of the Various Methods—A Problem of Everyday Interest—To be Followed by a Bibliographical Summary

By J. E. Dalemont.

We do not intend to discuss in this paper the respective advantages of all the methods pointed out by different writers for calculation of lines fed by alternating current. Such a comparative study would, indeed, be interesting, but it occurs to us that the reader will be more benefitted if we confine ourselves to pointing out those methods which seem to be the most simple and quickest for making this calculation.

In order, however, to allow the reader to make a choice among all the different methods, we will add a complete bibliography of same to the end of this article.

Induction and Capacity of Lines

In a transmission line fed with alternating current, two well known phenomena take place, namely the inductance due to the self induction of the line and the perditance due to the capacity. The e.m.f. of the induction lags 90 degrees behind the current, and its value depends on the frequency, the distance apart of the wires, and their diameter.

The vector of charging current lags 90 degrees before the e.m.f., and depends on the constants of the line.

To calculate the influence of this inductance and perditance on the tension of the lines, we require to know the coefficient of the self induction and the capacity of the line.

A—Single phase lines—The self induction coefficient of single phase lines may be expressed as

$$(1)\quad l = \frac{1.475}{10^3} \log \left(1.28 \frac{d}{r}\right) \text{ henrys per mile,}$$

where d, the distance between wires, and r, their diameter, should be expressed in inches.

B—Three phase lines—For a three phase underground line, we may assume that the line is replaced by a fictive single phase line, transmitting the same power, but with a tension $\frac{1}{\sqrt{3}}$ of that between the three phase wires. The self induction coefficient which we have to consider in this case is expressed by:

$$(2)\quad L = \frac{.7375}{10^3} \left[\log 1.28 \frac{d}{r}\right] \text{ henrys per mile.}$$

These formulas (1) and (2) are also applicable to underground cables.

In short distance transmission lines, where the tension is not too high, either the charging current may be neglected, or the capacity of the line may be considered as concentrated at two or three points only. But for long distance and very high tension, especially when the frequency of the distributed power reaches 60 periods or more, the calculation should be made on the basis of an evenly distributed capacity. It is therefore important to know the capacity coefficient of the lines. Different formulas for expressing this coefficient have been given; some of these take into account the ground influence; others, the effect of the lag of the charging currents in a three phase system.

The capacity coefficient in a single phase overground line is expressed by

$$c = \frac{0.0194}{10^6} \cdot \frac{1}{\lg \frac{d}{r} \cdot \frac{2h}{\sqrt{4h^2 + d^2}}} \text{ farads per mile}$$

where d is the distance between wires, r their radius in inches, and h the mean height of the wires above ground.

In a three phase line, a double value would be adopted for c, that is

$$c = \frac{0.0389}{10^6} \cdot \frac{1}{\lg \frac{d}{r} \cdot \frac{2b}{\sqrt{4h^2 + d^2}}} \text{ farads per mile}$$

For underground cables with two conductors, single phase lines:

$$c = \frac{0.0193k}{10^6} \cdot \frac{1}{\lg \frac{2b}{r} \cdot \frac{R^2 - b^2}{R^2 + b^2}} \text{ farads per mile}$$

where k is the dielectric constant (for paper, k is about 3,5); r, the radius of each core in inches; b, the distance between the axis of the wires in inches; R, the radius of the cable in inches. If the two conductors were concentric, the value of c would be expressed by $C = \frac{0.04\,k}{\lg \frac{R}{r}}$

In three phase cables the "star" capacity, that is the capacity of each wire considered in connection with a fictive return wire, where tension between both would be $\frac{1}{\sqrt{3}}$ times the normal tension, is expressed by:

$$c = \frac{0.0775k}{10^6} \cdot \frac{1}{\lg \frac{3b^2 \,(R^2 - b^2)^3}{r^2 \quad R^6 - b^6}} \text{ farads per mile}$$

k, being the dielectric constant; r, the radius of each core in inches; b, the distance between the axis of each core and the cable axis in inches; R, the radius of the cable in inches.

The use of these different formulas by those who are often called upon to calculate lines, is very important. If we take into account the self induction only, we know that when the line is at no-load with its receiver circuit opened, the tension is practically the same at both extremities and no current is supplied by the generator. But, when there is a capacity effect, the result is that at no-load the line will carry a current, since the tensions at both extremities are different.

(To be continued)

Direct Current High Tension Transmission

Review of the Direct Current High Tension Situation—Advantages in Certain Cases Very Marked — The European Continent in the Van

The use of direct current for transmission purposes has been to a certian extent familliar since the early days of electric lighting, and we are all more or less acquainted with the old d.c. arc lighting systems, which were among the first in the field. Until Thury, however, turned his attention to the subject, some years ago, its use for actually transmitting power on a commercial basis, had never been considered seriously, though Kelvin, and a few other far-sighted scientists, who appreciated the immense benefits of the system, had dreamed of a time when the use of direct currents for long distance transmission would be a commercial possibility.

That this time has now arrived is apparent, as the system has been in use on the continent of Europe for some years, and has demonstrated its practicability wherever it has been tried. The increasing use of the system calls for the attention of Canadian engineers, who might find it of value in certain cases, and it is, at least, worthy some attention, if only to broaden our outlook in the field of power transmission.

As many engineers on this continent are not familiar with the system, a few words of explanation of the apparatus and the methods of operation might not be out of place at the present time, and the following article is an attempt to place the main features before electrical students.

It is well known that the use of alternating current for long distance transmission involves the overcoming of many very serious problems, chiefly due to impendance and line capacity and it is only by the excercise of great skill and technical knowledge that these difficulties have been overcome, and even yet, we experience severe trouble, from these phenomena, as all operators of large systems are only too well aware. The elimination of the effects of these phenomena can only be brought about by the use of direct current.

The use of direct current, of constant value, means that there is no disturbing effect due to alteration in the potential of the wire or of the magnetic field surrounding the wire, and hence the effects mentioned above which are due to these causes are eliminated from the system. There are, of course, slight changes in the current strength, but these are so small as to have no effect.

The following diagram shows the simple case of a series generator, line, and series motor at the receiving end of the line. The method of operation is extremely simple, as can be seen by the small amount of apparatus necessary. Fig. 1.

In addition to the generator itself, the power station contains an ammeter, voltmeter, main switch, and usually, an automatic short-circuiting switch. The control apparatus at the motor end is similar. On starting up. at the power station, the main switch is in the short-circuit position, and the generator is run up till the current reaches the normal. The switch is then opened, permitting the full load current to pass along the line, through the motor switch, and hence back to the generator. To start up the motor, which has its brushes set right back at the "dead" position, the motor switch is opened, passing the full line current through the motor, which comes up to speed on gradually moving the brushes forward. As the load comes on the motor, the brushes are moved forward, to keep the machine up to its speed, this operation being performed by an automatic regulator. The generator speed is also raised, or brush position altered to increase the voltage, this also being controlled by means of a regulator.

The automatic switches are necessary at the motor end to short-circuit the motor, should an open ciruit develop in the armature or fields, and at the generator end, to perform a similar function, should the line become open between the power station and substation.

This system may be amplified by having more than one substation in series in the main circuit, or power may be taken off to individual users on the line of transmission. This latter case will, as in the case of the a.c. system, depend largely on the size of the demand, as it would not be economical, owing to the large current, to include small apparatus, with its greater risk of breakdown at high voltages, and also the risk to unskilled labour which alone can be employed profitably on small installations. Each substation, as in the case of a.c. systems, may be used to transform the line pressure and system to those of ordinary commercial utility, or may be in the form of prime movers for some industrial concern, taking power in units large enough to warrant the capital expenditure necessary for the high tension gear and protective devices.

A brief consideration of the line conditions will show that the d.c. system offers many advantages over the a.c. in several directions. First and formost is that of the amount of insulation required. It has been demonstrated that though the theoretical value of the voltage may be in the ratio of 141 to 100, in actual pratice, it is found that the direct current pressure may be nearer 2½ times the a.c. pressure (R.M.S. value) with the same margin of safety, and furthermore, the loss from leakage, which is a serious matter on a.c. systems having very long or numerous transmission lines, is very small indeed. As an instance of this, it may be mentioned that the Lausanne line, which is a small one, and carries 4,500 h.p. a distance of 35 miles, showed a total line loss through leakage over 3,000 insulators of a very small pattern, of only 866 watts at 20,000 volts pressure between line and ground, in wet weather.

The limit of line voltage is wider in the d.c. system, as it is usual to ground the neutral point, converting it into a three wire system, and thus have only half the line voltage as the breakdown pressure between the highest point and the ground. This again raises the permissable pressure that can be chosen for any given scheme, as the insulation of the apparatus to be connected is a most serious problem in the choice of line pressure in any system.

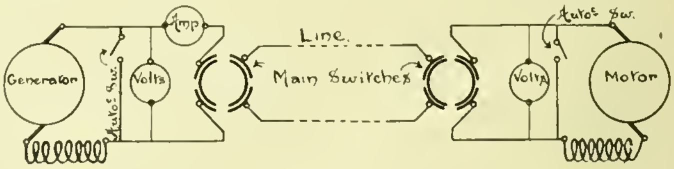


Fig. 1.

The line again, consists of only two wires, in the case of a single line, or four, in the case of a duplicate one. The line construction is thus simplified, and furthermore, the question of spacing does not require the consideration that is necessary with a three phase system. The layout of the line is considerably modified, as the system may be in the form of a ring, positive going out of the station in one direction, and the negative going in another, avoiding the necessity of many branches with the increased risks attached, which would be necessary in an A.C. system. There might not be any considerable saving effected in the number of poles required, but all the special junctions would be avoided, with their constant liability to trouble.

The size of the line is dependent, as in the A.C. system, upon the maximum current to be carried, and this is again a question of the permissable drop. In the case of water driven stations, the value of the units lost in the line does not cut any great figure in either system, except that regulation becomes a difficult matter at full load in the parallel system, if the current density is carried too high. In the series system, the line losses remain constant at all loads unless the whole power transmitted is handled in the substations of the power supply company, in which case the line current may be reduced considerably during periods of light load, thus cutting down the losses.

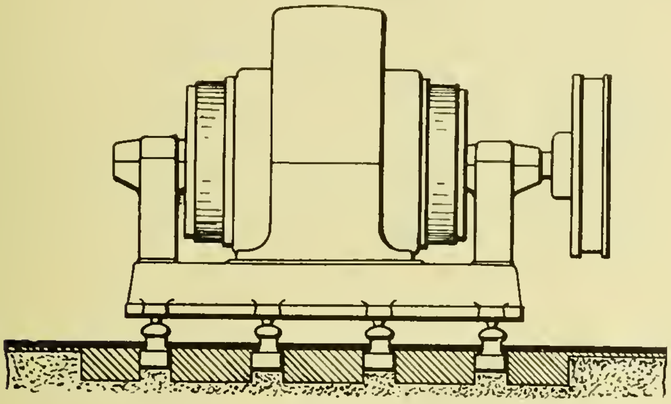


Fig. 2.

Depending on the amount of power to be transmitted is the question of the pressure to be employed in the power station. The commutator imposes limitations on the voltage generated in each machine, unfortunately, and thus it seems that we are restricted to comparatively small units for our power station; it is usual, however, to couple one prime mover to a double commutator machine, and thus have double the capacity to which we are limited by each commutator

The present limit of pressure for a single commutator appears to be six thousand volts, and thus each unit has a terminal pressure of 12,000 volts. Assuming a line current of 500 amp., this allows us to use units of 6,000 k.w. capacity, and, if necessary, this size could be doubled by having two such machines coupled to the one prime mover, having four commutators per unit, and giving us a capacity of 12,000 k.w. per set, which seems to be about the present maximum practical, economical size of plant to lock up in one set. The expedient of four commutators per unit, has not yet been tried.

Since some of the generators in the three wire system must have half the maximum line pressure each to ground. it is necessary to adopt special means to secure safe insulation. The ordinary insulation that could be put into the armature windings and commutator would be entirely inadequate, and therefore, the old expedient of insulating the whole machine is adopted. It is also necessary to protect the operators to handle one pole at a time in perfect safety. the station is an insulating one, rendering it quite safe for the operators to handle one pole at a time in permect safety. Fig. 2 shows a section of a typical station, with the insulating floor. The machine is mounted on strong insulators, embedded in cement, while the floor itself consists of asphalt concrete, covered over with a layer of pure asphalt. It is thus a simple matter to insulate for any practical working pressure. There is an insulating coupling between the generators and the prime mover, of the Zodel or Raffard types usually, and couplings of this nature can readily be constructed for working pressures of 70,000 volts to ground, or 140,000 volts line pressure, or a total output of 70,000 k.w. with a line current of 500 amps. With this system of insulation it is found quite safe for the operators to handle the machines, adjust brushes, and clean commutators—in fact, they are handled much in the same way as we are accustomed to handle the usual railway generator.

One feature employed in these D.C. schemes is the safety coupling, which is designed to slip when a certain load is exceeded. This saves damage to the generators in case of very severe and sudden short circuits. This device is, of course, only used in the case of water turbines, where the slow movement of the gates might result in damage being done before the speed could be reduced sufficiently. In the case of steam or gas-engine drive, such devices are unnecessary.

The current being kept constant, the changes in load are met by alterations in the line pressure, the pressure increasing with increase of load. This change of pressure is effected automatically, and may be by altering the speed of the prime mover, the brush position being maintained constant, or, should it be preferable to keep the prime mover speed constant, by varying the brush position. In either case the same type of regulator is used, consisting of a solenoid which actuates a balanced armature, bringing it into operation with slight changes in the line current. The armature controls two pawls fixed to a rocking shaft driven by a small motor, also in series with the line. Should there be any change in the value of the line current, one or other of the pawls is brought into action, turning a wheel which controls the governor of the turbines or engines, or actuates the rocker arms of the machines. Both motor and regulator are operated by the full line current (which may be shunted, however), and for the motor, there is generally held in reserve a small battery, in case of interruption to the main circuit. A similar type of regulator is used to regulate the brush position of the motors, but in this case, instead of a solenoid, a small centrifugal device driven from the motor shaft is employed to actuate the pawls, and the brush-shifting device is also driven from the motor shaft.

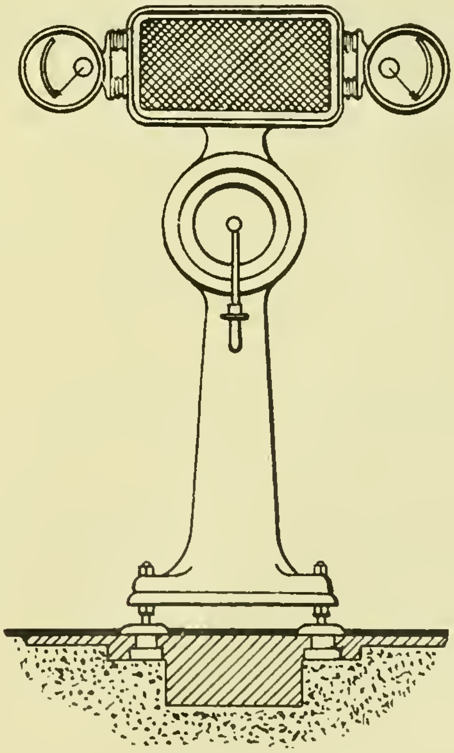


Fig. 3.

The line switchboard is of the simplest possible description; it contains a main ammeter, voltmeter to read the total station volts, and a short-circuiting switch to cut out the line if necessary. Each machine is controlled by a switch pillar, of very simple design, a drawing of which is shown in fig. 3. This pillar contains a four-way switch, ammeter, and voltmeter, to read the machine voltage. It is also mounted on insulators, and is perfectly safe to handle. The controlling apparatus for the motors is similar to that of the generators, but it contains, in addition, an automatic cutout, operated by a solenoid, which short-circuits the motor in case of excessive pressure, or in event of anything happening to the motor armature or fields. One important feature of the system is that a short circuit reduces the load on the machines, if it is one that is not applied too suddenly, giving the regulating gear time to act over its full range. In this connection, it might be mentioned that the regulator as normally designed, will rock the brushes over their full range in three seconds.

From the above brief considerations of this system, it will be seen that it is a very simple matter, should local conditions demand it, to run two or more stations in series, when the difficulties of paralleling which are inherent in the parallel system are avoided. This may be of great importance where the supply of water is variable, and thus, an additional station may be added to one where the load conditions demand extension, but the available water supply is being used to the full.

Some of the advantages of the system may be summarized as follows:

1. Simplification of switch and regulating gear.
2. Easy working of several stations in series so that the more efficient may be worked always, and the less efficient only at times of peak.
3. Efficient speed regulating of sub-generators where such is necessitated in special cases, as electro-chemical work.
4. Greater all-round efficiency where generators are driven by turbines on falls subject to considerable variation in head
5. Higher pressures permissable with same factor of safety as A.C. system.
6. Independence of voltage regulation.
7. Parallel running not necessary.
8. Lighting troubles more easily deal with.

Some of the disadvantages of the system are as follows:

1. Necessity of using comparatively small generating units.
2. Necessity of using rotating machines at all substations.
3. Risk involved in having full line pressure on rotating machines.
4. The disadvantages attaching to commutating machines.

Space does not permit of entering into the relative costs of the two systems, nor into the annual outlays for running, repairs and maintenance, all of which have, of course, an important bearing on the choice of system, but enough has been said to show that in special cases, the series system has so much in its favor that it should be given special consideration when such cases come to the attention of any engineer.

In closing, it may be stated that the series system of power transmission is by no means in its experimental stage, as M. Thury has had several stations of comparatively large capacity running successfully and without trouble for a number of years, and the system has been in commercial operation for the last twenty years.

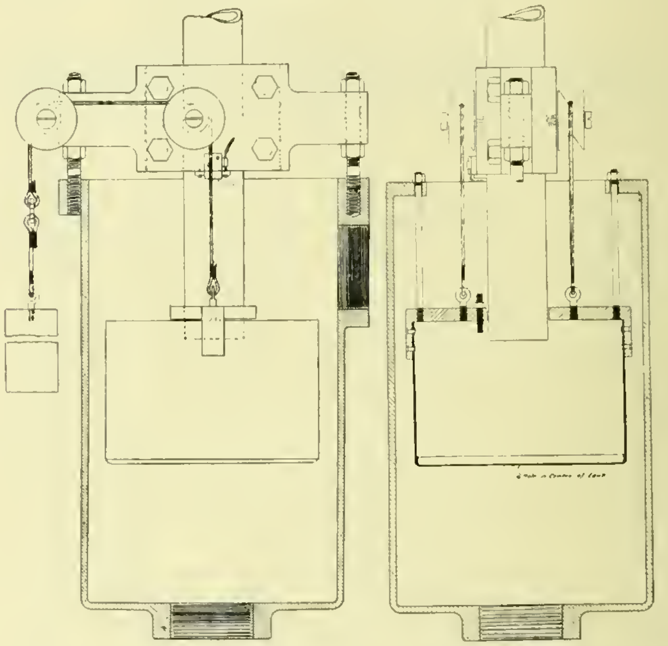
After tractions troubles extending more than eight years, the Cleveland council has passed an ordinance granting to the Cleveland Ry. Co. a general franchise for a term of 25 years. It provides that the company shall give a 3-cent fare service with one cent for transfers, but may be increased to four cents if this rate does not bring in an income of 6 per cent.

A New Alarm Device

R. S. Kelsch

On account of the many accidents and much damage to transformers, resulting from the failure of water supply, etc., a device has been placed on the market to take care of such emergencies. The device is patented and consists of a small attachment placed in the water pipe supplying water to the transformers. This takes the place of the funnel employed heretofore, located immediately at the transformer to catch the water running through the transformer.

A number of cases have occurred where the water pipe has frozen or the water supply been shut off from different causes, and in some instances, the waste pipe has frozen or choked up, causing a flood. The alarm device is a simple arrangement and consists of a float so arranged that if the water fails or if the waste pipe chokes up, it will operate and notify the station attendant—by ringing a bell, lighting lamps, etc. The several manufacturers of electrical apparatus throughout Canada have purchased the right to make the device and supply it with their transformers, and it has been installed in a number of plants and found to be of great value. This device is also suitable for registering the amount of oil consumed by any machinery that requires a flowing oil lubrication, such, for instance, as in the case of roller bearings immersed in an oil bath.



The Kelsch Alarm Device.

Engineers wishing to have this device attached to their transformers, should have their specifications read as follows: "Each case will be provided with one visible water supply indicating device showing water flowing from the coils, and so arranged that when the water fails to circulate or the waste pipe chokes up, a local circuit will automatically be closed and an alarm given to the station attendant."

At present there is under construction in the Westfjord valley in the district of Jelemarken, Norway, a hydro-electric plant which in many respects is considered to be the largest in the world. Advantage is taken of the Rjukan Falls in the River Manne, one of the largest waterfalls in Norway. By diverting the water from the river, at a distance above the falls, the available head is increased to about 1,800 feet, which is being divided into two steps. Two plants will be erected, called Rjukan I and Rjukan II. The rating of the plant is estimated at about 250,000 h.p.

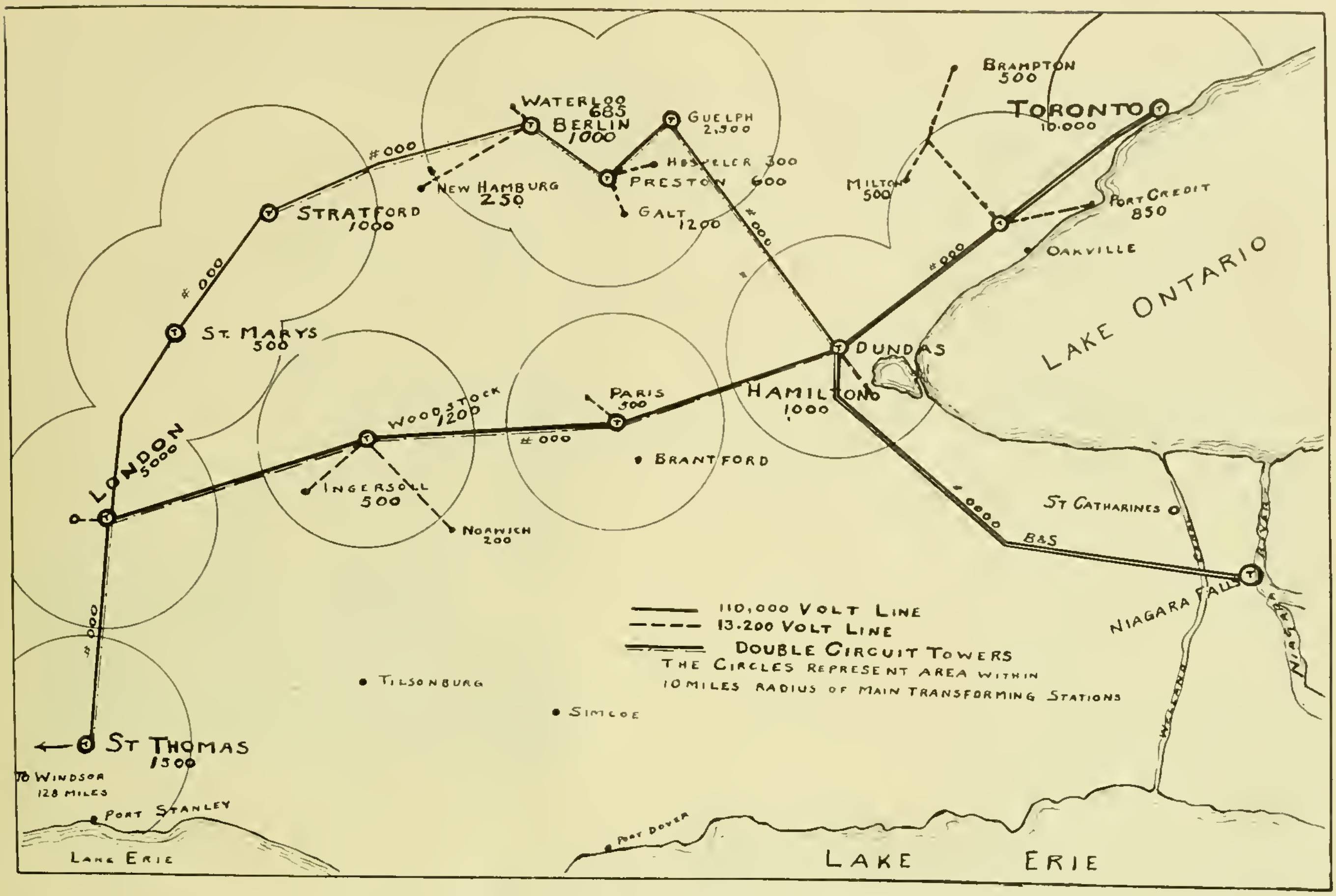


Fig. 1.—Area Served by Ontario Government Transmission System.

Ontario Government Transmission System

The Ideal Function of a Government—Current Pressure Highest in the World—Unusual Factor of Safety at Every Point—A Description Without Technical Terms

P. W. SOTHMAN.

The system of power distribution which the Ontario Government is at present carrying to completion with all reasonable haste, represents what is probably the nearest approach to the ideal conception of a Government's function, viz., by administrative and financial assistance, the making possible in a few short years, such a rapid industrial development, in a section of the province, as, without assistance and under natural conditions, could scarcely be looked for in as many decades. The section that may be designated as southwestern Ontario comprised a thickly populated rural community and a large number of cities and towns, all alive, as their actions have since shown, to the need of light and power. The power was waiting ready for development but, unfortunately, just beyond their grasp. The Ontario Government is simply lending its aid to bring together the demand and supply under the most favorable conditions.

The conditions under which power is supplied requires that each municipality shall do its own distributing. The Government, through its agent, the Hydro-Electric Power Commission, agrees to deliver energy to the boundary line of the municipality only. The exchange of energy from the Commission to the municipality is made always at 13,200 volts. The cost to any given municipality is governed by its distance from the source of supply, the quantity of power taken and by any other varying factors attending its inclusion in the general scheme of distribution. The area covered by the present installation is shown in the accompanying diagrammatic map, fig. 1.

In as few words as possible the writer will endeavor to treat the different phases of the work under its various subheads and, without at this time employing any technical language, attempt to give the general reader a comprehensive view of the scope and more important items of construction of this distributing system.

The Power Supply

A contract has been entered into with the Ontario Power Company, of Niagara Falls, to supply an amount up to 60,000 h.p. This amount, it is believed, will be sufficient for all immediate needs. In view of our dependance on this company a few words as to their ability to supply the required amount of power may be of interest. The Ontario Power Company's plant is situated on the Canadian side of the river just below the falls. The generating station stands beneath the rocky cliff almost on a level with the river. The water used for power generation is taken from the river at a point some half-mile above the falls, and carried by an 18 foot circular, metal, conducting tube from this point, along the bank of the river, to the generating station. This conduit tube supplies sufficient water for seven large turbines aggregating 80,000 h.p. A second conduit tube, also 18 feet in diameter, is at present being laid. This will double the

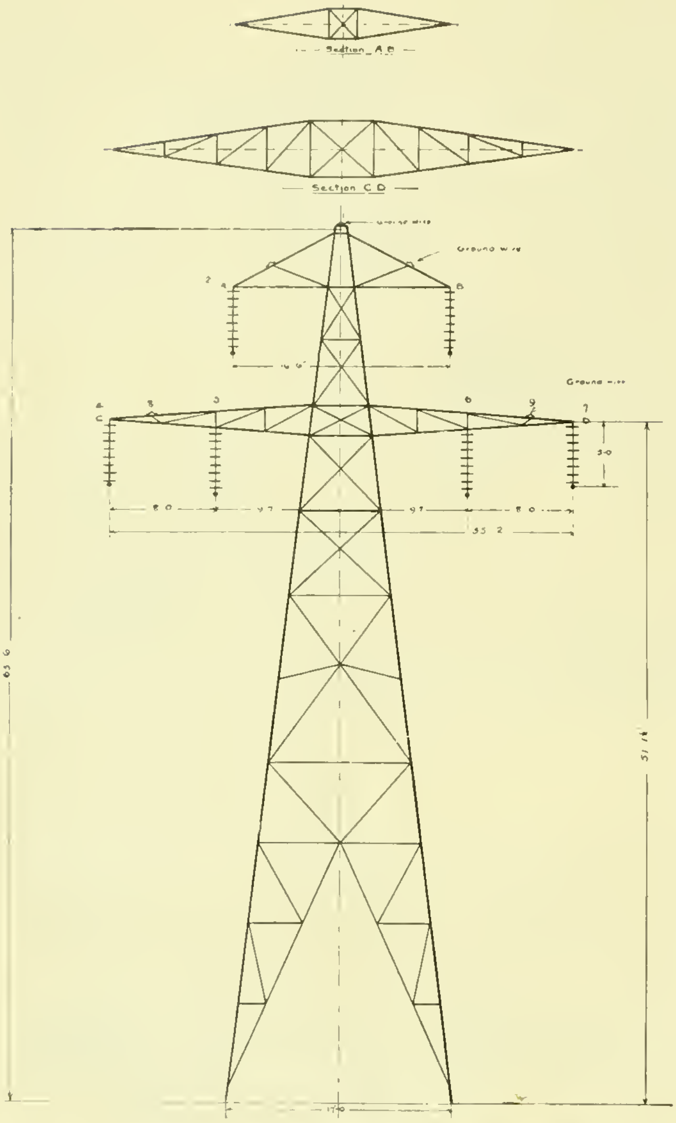


Fig. 2.

capacity of the plant and make it the largest water generating station in the world. A third conduit tube, for which the company holds charter rights, and for which installation plans are already under way, will bring the total capacity of this immense plant up to 220,000 h.p. Just over the hill back of this power house and just outside the border line of Niagara Falls town the Hydro-Electric Commission is building a large transforming station with a capacity of 60,000 h.p. when complete. Electric energy is delivered at this point by the Ontario Power Company, through underground conduit, at 12,000 volts. The first act of the Commission is to step this up to 110,000 volts ready for distribution.

Territory Served

The territory that will be most benefitted in the immediate future is shown in the accompanying map, fig. 1. Two factors at least, have determined the boundaries of this area, (a) proximity to the source of supply, and, (b) the relatively large number of good sized towns lying, often, within a few miles of one another. It can be seen from the map that the numerous circles, representing approximately the suburban territory that may be served from the central point, cover a very large percentage of the total area, in some cases overlapping. In the distribution scheme, then, it has not been so much a question of reaching any particular point, as of finding a market sufficiently large to justify the expense of construction to that point, and so, in this respect, southwestern Ontario has proven the most satisfactory field for operation.

The figures placed below the names of towns and cities on this map indicate the minimum number of horse power the different municipalities are required to guarantee payment for; in many cases this amount will be overdrawn from the start. The total amount to date is in the neighborhood of 30,000 h.p., but this is being constantly increased by the addition of smaller towns not included in the above list. In the near future it is proposed to run a third transmission line south and west from Dundas to St. Thomas, approximately parallel to the two present lines, and serving the district including Hagersville, Waterford, Simcoe, Tilsonburg, Aylmer, etc., etc.

Distributing System

The centre of the distributing system is at Dundas, seven miles from Hamilton. From the generating station to Dun-

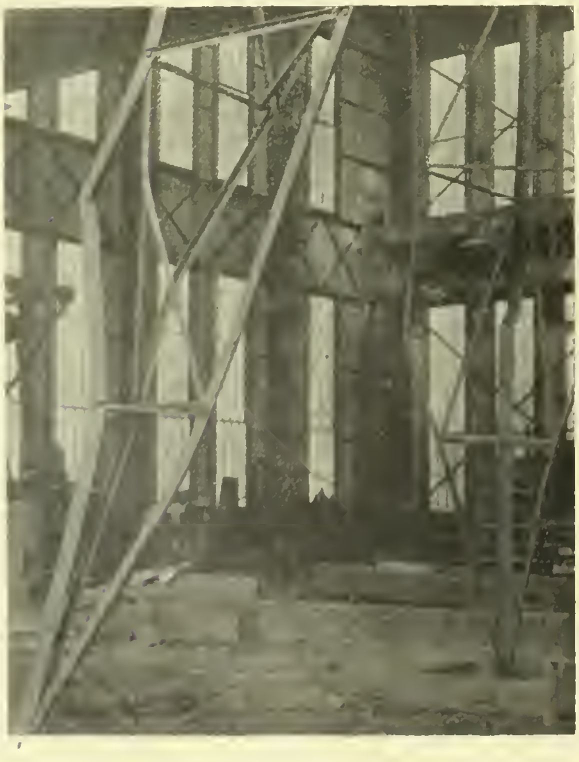


Fig. 3.

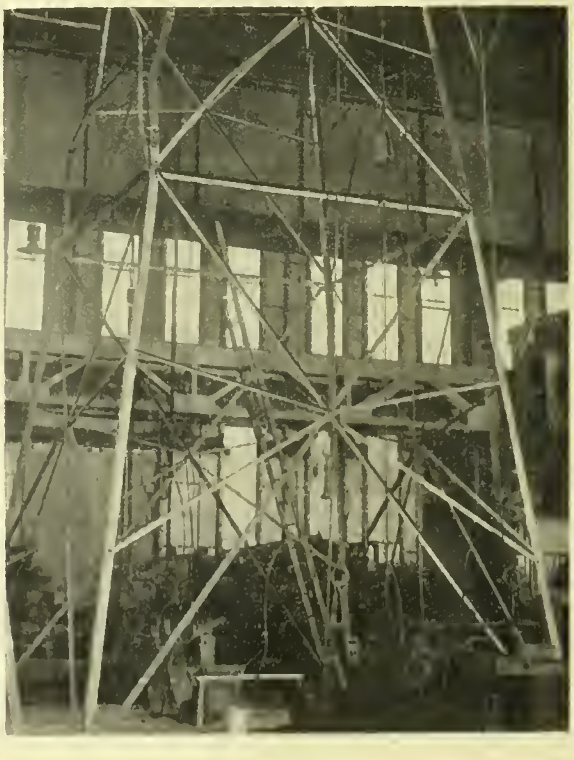


Fig. 4.

das the current is carried by No. 0000 B & S aluminium cables. From Dundas out, east to Toronto and west to St. Thomas, London, Stratford, etc., the cables are No. 000 B & S aluminium. The total length of the line being installed at present is about 290 miles. Throughout this distance the pressure is 110,000 volts. As indicated in the map, there is a double transmission line, consisting of two sets of three cables each, carried by a single row of double circuit towers, from Niagara Falls to Dundas and from Dundas to Toronto. The line from Dundas to Stratford by the upper route and from Dundas to London and St. Thomas by the lower route is a single circuit three cable line as yet, but provision has been made for doubling the capacity of this line in that all towers installed on this section are also double circuit towers. From Stratford to London the line is equipped for single circuit only.

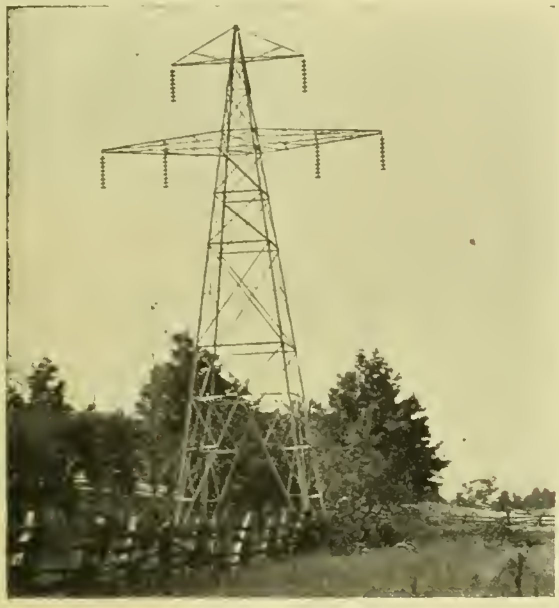


Fig. 5.

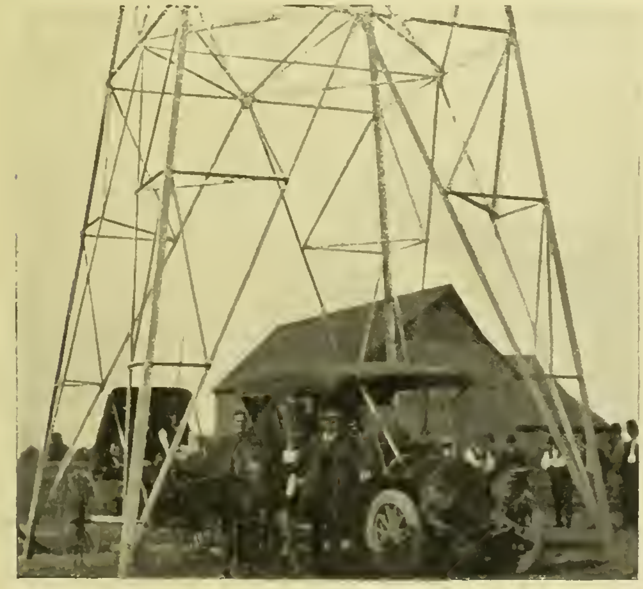


Fig. 6.

LINE LOCATION—The transmission lines, for the most part, and other things being equal, follow a course as the crow flies. In many cases, however, it has been deemed advisable to diverge somewhat from this rule in order to follow along a highway or cross in the vicinity of railway stations or villages—the necessity for this will be evident when it is remembered that each point of the transmission system will be patrolled every day. As a general rule, paralleling of steam railroads has been avoided on account of the oil, soot, smoke, etc., which are found there and which, by settling on the insulators, have been shown in a number of cases where transmitting wires have been so placed to greatly reduce their insulating capacity. In one other instance, the main line from Niagara Falls to Dundas, the wires were placed many miles farther south than was at first planned in order to keep clear of an area in which violent electric storms are known to be frequent. This information was gleaned by actual and systematic inquiry among the oldest inhabitants and by studying the records of the telephone and telegraph companies operating in this district. The greatest care was taken to make this investigation complete and it is believed that, as a result, the zone through which our transmission line passes is reasonably safe from extraordinary lightning occurrences.

THE TRANSMISSION LINES LOUPED—Referring again to the map, fig. 1, we see that the transmission lines west from Dundas form a complete loup. The projected third line running south through Simcoe, Tilsonburg, etc., will run all the way to St. Thomas and form a second complete loup. In the near future it is planned that another line will join Guelph through Georgetown and Brampton with Toronto, thus forming a third loup. By this plan of louping it is hoped, in case of accident to the line, to avoid interruptions in the service at any point other than where the accident actually occurs. For example, suppose the transmission line is broken between Berlin and Stratford; this would ordinarily deprive Stratford and St. Mary's of power and light. By the existing arrangement, however, the current through Woodstock can be switihed on at London and power supplied to both ends of the broken line from opposite directions.

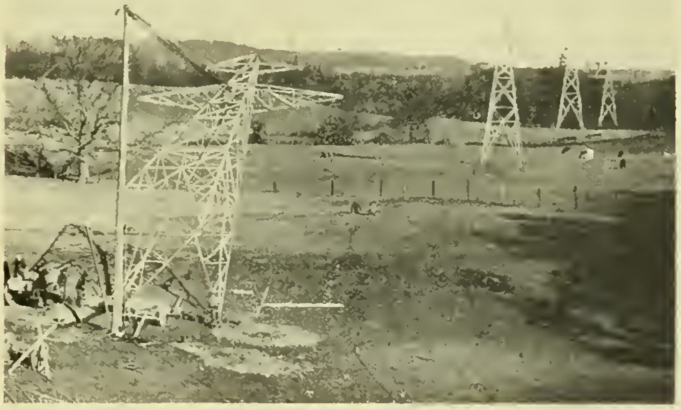


Fig. 7.

THE TOWERS—Metal towers are being used throughout, one of which is shown in diagram in fig. 2. In all, about 3,000 towers will be required for the 290 miles; an average of 10 to the mile, or one every 525 feet, though special conditions may cause these distances to vary. Before deciding on the particular type of tower to be used, exhaustive strain tests were made in different directions and at different angles, on two competitive types of tower, one constructed according to the Hydro-Electric Commission's own plans, the other being supplied by a manufacturing establishment that wished to submit tenders for the supply of this part of the material. The bases of the towers having been firmly fixed, varying pulls were exerted from different points on the framework.

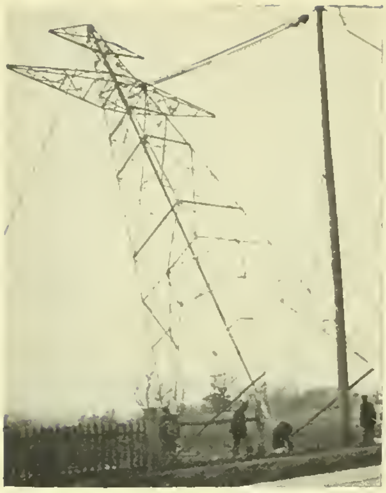


Fig. 8.

The Commission's tower withstood, without injury, a horizontal strain up to 20,000 pounds, but at 20,950 pounds was bent over as in fig. 3. The other tower on which similar tests were made collapsed under like conditions with a 14,650 pound pull, fig. 4. It will thus be seen that the tower chosen is stronger by over 40 per cent. A completed tower is shown in fig. 5. Note the roominess of the base, which will allow of cultivation right under the line, and so means less loss of land to the farmer. This is well illustrated also in fig. 6. A row of erected towers across country is shown in fig. 7.

The height of a tower is 65 feet 6 inches over all; the upper arm is 16 feet 10 inches, the lower arm 35 feet 2 inches in length. The conducting cables of each circuit are approximately 9 feet apart. A complete insulator is 5 feet 2 inches in length. The tower base is square, 17 feet to a side. The tower footing is sunk 7 feet 6 inches in the ground. No concrete is used except in rare cases, such as soggy ground or hillsides. The bottom 6 inches of the hole is filled with fair sized stones; then a 22 by 34 inch iron grate placed horizontally is bolted to the iron foot; earth is filled in to within 18 inches of the surface where more stones are used.

Where the Welland canal is crossed much higher towers are to be used to raise the wires 150 feet above the highest water level, as required by law.

The weight of the standard towers is 3,995 ponds. Towers are shipped in sections about 22 feet long, and each is assembled lying on its side close to the footing excavations. They are erected by block and tackle arrangement, one team of horses being sufficient. To erect a completed tower requires from 10 to 12 minutes only. Fig. 8 indicates the plan of erection.

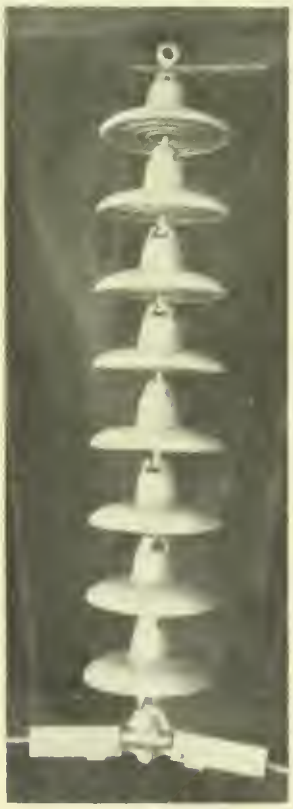


Fig. 9.

INSULATORS — A large number of various types of insulators were submitted for comparative tests. It was necessary to take into account the fact that although the line was nominally carrying a 110,000 volt current, yet abnormal conditions may set up surges on such a long line sufficient to raise the voltage momentarily well up to 200,000. For this reason severe tests were made, under both wet and dry conditions, with voltages up to 400,000. Strain tests were also made to determine the mechanical strength of the various types. The choice of a proper insulator was considered of such importance that two engineers spent three months making these tests before it was entirely evident which was the very best of all the types submitted. The final choice is reproduced in fig. 9. It may be described as a one piece, eight unit, suspension type insulator. The total length of the insulator is 5 feet 2 inches, the width of each unit 11 inches. It will be noticed that there are no sharp corners about this pattern from which discharges may easily leak aff; also the different sections are connected by a ball and socket arrangement allowing freedom of movement. When this insulator is in position on the tower its lowest point is 46 feet from the ground.

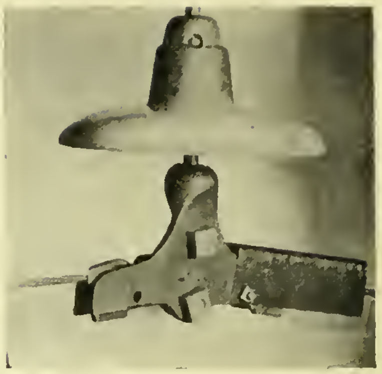


Fig. 10.

The severity of the tests may be shown in another way. It is a well known fact that, when subjecting a large number of insulators to a test a certain percentage of these insulators will break down instantaneously, a smaller percentage during the next instant, a still smaller percentage during the next short interval, and so on, the percentage rate decreasing rapidly as the end of the first minute is approached. After this time the weak insulators will have been entirely eliminated and no further breakdowns will occur though the test may be continued for two or three minutes. Fig. 11 illustrates this property in a general way. Manufacturers' tests often mean instantaneous tests only, but the Commission's tests were always maintained for the two or three minutes required to reach the steady state.

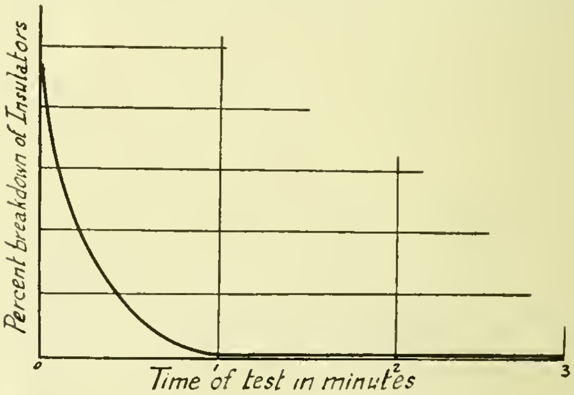


Fig. 11.

PRECAUTIONS AGAINST LIGHTNING—Lightning troubles are guarded against by the erection of parallel ground wires, the whole length of the transmission line, which are placed on the upper side of the tower arms, near the ends of the arms, as shown in fig. 2, and in this position they form a sort of canopy over the transmission cables. The ground wires are 5-16 galvanized steel cable, each being naturally earthed by metallic contact with the towers. Provision is made for a fifth ground wire on the very peak of the pole, but it is not thought this extra cable will be necessary.

A PROTECTING HOOD—Where the transmitting wire is clamped to the insulator there is always the possibility of a discharge from the latter to the wire, which in time might injure the cable at that point by burning it. To overcome this danger a protecting hood is attached, as shown in the sketch, fig. 10, which bears the brunt of the discharge and so protects the cable. The sketch shows one-half of the hood removed.

Electric Traction—Topics of Interest

Description of New Booster Successful Single Phase Railway The Accident to Winnipeg Power Plant

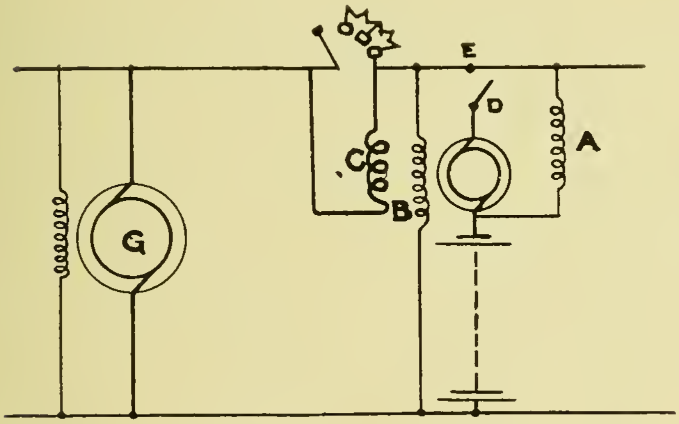
A British Type of Booster

G. E. Mason

A type of automatic booster that has met with a considerable amount of success works on the following principle:

Referring to the figure and omittig for the moment the coils B and C, it will be seen that the coil A is excited by the difference in volts between the battery and the busbars. Thus, if the battery is, say, 550 volts and the bus 600 volts, this coil will have 50 volts across it. It is of such a strength that it makes the booster armature give the exact voltage that is across its (the coils) terminals. The points D and E, therefore, will always be at the same potential ,whatever the state of the battery or bus volts, and this being so, the switch DE may be closed under any condition of voltage and the battery will neither charge or discharge however much the bus volts alter. The battery being in this state, it only requires the booster to give an extra volt or two in either direction to make the battery charge or discharge heavily. This extra volt or two is obtained by the coils B and C.

B is a shunt coil on the booster excited from the bus bars, and is connected so that it tends to make the booster give a voltage that will charge the battery. The coil C is a booster series coil and carries a portion of the generator current; it has the tendency to make the battery discharge. In working with a varying feeder load the connections are as in the diagram, the coils B and C opposing each other equally when the generator has, say, full load. Suppose the feeder current increases; if the generator takes the least bit of this load, the coil C overpowers the coil B, and the battery discharges heavily, for the coils are so designed that an increase of a very few amperes in the C coil causes the battery to discharge. Now, the battery volts drop as soon as it commences to discharge, but it does not require the current in C coil (and therefore the generator current) to increase to compensate for this, because the A coil increases the booster volts by the amount that the battery volts have dropped. Thus, an infinitesimal increase or drop in the generator load is all that ever takes place under all conditions of external load.



Further, it will be seen that no hand adjustments are required owing to the variation of the battery volts from a straight line curve under varying rates of discharge, due to its state of charge All changes, either of generator or battery volts, are taken care of by the coil A. It is usual to design the C coil to carry about 500 amps; all generator current above this is carried by a shunt across the coil. This shunt is provided with several steps, so that the amount shunted can be varied according to the number of generators that are on the line, but beyond this it is only used for regulation when it is desired that the generator load should rise and fall with the external load. In this case more current is made to pass through the shunt, thus weakening the action of the coil C, the strength of the A coil being reduced for the same purpose.

The absence of an exciter makes this booster efficient and the first cost low. The booster magnets are built up of thin laminated iron plates to prevent lag in the field circuit, this being one of the reasons for the great success of these boosters. There are a large number in operation at the present time, the makers being the Lancashire Dynamo & Motor Company, Limited, Manchester, England.

Single Phase Railway System—Efficiency and Low Operating Costs

The only 15 cycle, single phase, alternating current railway in America is the Visalia Electric Railroad, running from Visalia to Lemon Grove, Cal. After two years of successful operation, this pioneer 15 cycle development has fully justified the confidence of its builders in selecting a system of electrification without the restrictions for heavy main line service shown by the other systems investigated. The present length of electrical operation is 22 miles.

For a distance of ten miles, between Visalia and Exeter, the electric railway traverses the main track ot the Southern Pacific Railroad, which has been electrified over this section by the addition of rail bonds and the 3,300 volt trolley. The trolley construction is of the single catenary type, suspended from brackets on poles spaced 120 feet apart.

For this electrification, three phase, 60 cycle power is purchased at 35,000 volts, from the Mt. Whitney Power Company, which operates a hydro-electric generating plant on the Keweah river. At the Exeter substation ,located nearly at the centre of the present railway line, the 60 cycle power is stepped down to 2,200 volts, and then converted to 15 cycle, 11,000 volt, single phase current by a Westinghouse synchronous motor generator set. From the main frequency changing substation at Exeter, the 15 cycle, 11,000 volt feeder lines, made up of a pair of No. 4 bare copper conductors, transmit eight miles in each direction to the substations on the Lemon Cove and Visalia divisions. Transformers in these stations reduce the 15 cycle, 11,000 volt, single phase supply to the trolley pressure, 3,300 volts.

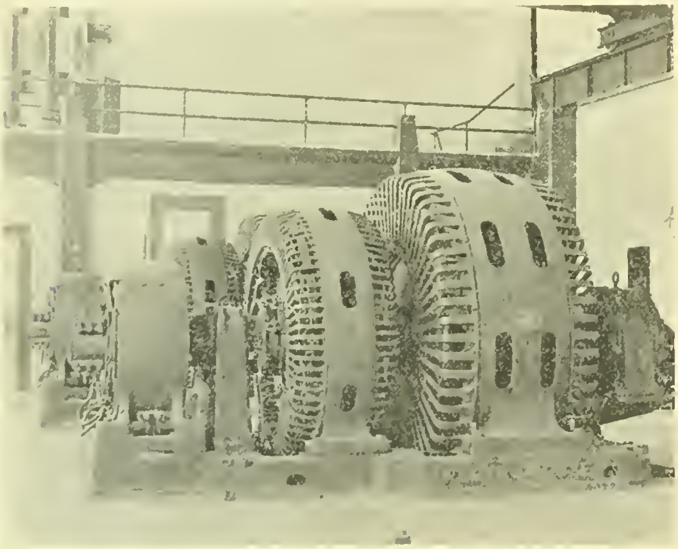
The frequency changer substation contains six 150 k.w. oil insulated, water cooled, 35,000 to 2,200 volts, 60 cycle Westinghouse transformers, and two two-bearing motor generator sets, each composed of a 540 h.p. Westinghouse synchronous motor wound for 2,200 volts, 60 cycles, with induction motor for starting; direct connected to a 375 k.w. rotating field single phase Westinghouse alternator, delivering 11,000 volts, 60 cycle current. The 60 cycle in-coming transmission line is protected by low equivalent lightning arresters, complete with oil insulated choke coils and disconnecting switches. Three 15 k.w., 2,200 to 200 volts, 60 cycle transformers are supplied for lighting service and for operating the motor generator exciter set. On the extended shafts of each motor generator set are mounted 125 volt direct current generators which furnish excitation current, in addition to a similar direct current exciter driven by a three phase 60 cycle induction motor supplied from the in-coming transmission lines.

The out-going 11,000 volt, 15 cycle feeder circuits are protected against lightning discharges by complete arrester apparatus, and are controlled by oil switches. The Exeter substation also feeds the trolley wire through two 300 k.w. oil insulated, self cooling, 15 cycle, single phase transformers, reducing from 11,000 to 3,300 volts.

The two 15 cycle transforming substations, each located about eight miles from Exeter in the direction of Lemon Cove and Visalia, respectively, contain a Westinghouse 300 k.w. oil insulated, water cooled, 15 cycle, single phase transformer, reducing from 11,000 volts to the trolley pressure. Lightning protective apparatus, choke coils, and high tension circuit breakers are included in the 11,000 volt apparatus, while the 3,300 volt trolley feeders are controlled by oil circuit breakers.

The 15 cycle, 3,300 volt, single phase trolley construction is of the single catenary bracket type, comprising 7-16-inch steel messenger suspended from poles 120 feet apart, and supporting No. 000 trolley wire. The redwood poles, 36 feet long, are set six feet in concrete.

In addition to passenger cars, the rolling stock includes one 45 ton electric locomotive with four 125 h.p. Westinghouse series, compensated single phase motors driving 36 inch wheels through a gear reduction of 17 to 66. This locomotive is capable of developing a continuous draw-bar pull of 1,500 pounds at 20 miles per hour on level track. The full load draw-bar pull is 9,000 pounds at 17 miles per hour on the level. The maximum starting pull is 17,000 pounds.



Frequency Changer in Visalia Railway System.

The following figures will afford the reader some idea of the economy with which this single phase, 15 cycle road is operating.

During a period of 10 days over which readings were taken, the average power consumption of the locomotive was 72.1 watts per ton mile.

During 60 days, the average output of the frequency changer substation was 70.25 watts per ton mile, although during another period of 30 days when operating conditions were better, the average station output was 66.6 watts per ton mile.

During 60 days of operation of the motor cars, the actual power consumption at the car was found to be 55.9 watts per ton mile.

The electrical equipment of the Visalia 15 cycle, single phase electric railway, including locomotive, cars, and substation apparatus, was furnished by the Westinghouse Electric & Manufacturing Company, Pittsburg, Pa.

Accident at Winnipeg Railway Power Plant

The following is an extract from the general manager's report of the accident:

The plant is situated 61 miles from the city of Winnipeg, on the Winnipeg river. On Tuesday ,Nov. 23, the generating station was under a load of about 12,700 kilowatts, carried by nine units. As the evening load increased and more gate was gradually applied, unit No. 7, carrying about 2,000 kilowatts or seven-eighths full load, suddenly burst on the south side, two plates giving way, twelve feet in length, and opening up about nine feet high. The bed casting of the draft chest on the down stream set of turbines cracked the entire distance through the line of rivet holes where these penstock plates were attached.

The volume of water which immediately issued from this great opening burst in the door, made a huge breach through the wall of the building between wheel units 7 and 8, and flowed directly on to No. 8 generator, filling that end of the generator room above the doors to a depth of eight to ten feet. The force of the water was tremendous and it spread, flooding the entire building and reaching a depth of from two to four feet in the most distant parts of it.

The men at the gates of No. 7 at the time of the occurrence had barely time to escape with their lives, one of them, in fact, being swept out the door at the north end of the building by the rush of water.

The rush of water was so great that it was impossible to reach the governor hand wheels to close down the turbines by way of the floor, but they were lowered down by ropes from the windows from the wheelhouse roof and in about four or five feet of water managed to stop all wheels except units 8 and 9, which could not be reached owing to the tremendous volume of water which rushed through and completely over them.

A staff of men under Superintendent Smeaton immediately undertook to lower the headgates, but the flow of water through the burst penstock made such a pressure against the gates that in spite of cranks, props and pries, the gates refused to budge.

As soon as it was realized that the interruption of the service was more than trifling, Manager Phillips, at Winnipeg, issued instructions to have the old steam plant used to generate power before the Lac du Bonnet was built, put into commission at once. Three years previously this plant had worked up to an overload of 8,000 h.p., but although the precaution had been taken of keeping up steam sufficient to turn the wheels over once a day, things were naturally not in condition to get back to former efficiency, and in any case the power at full capacity was far below the present requirements of Winnipeg.

All attempts to shut off the water entirely failed. The only means which could be devised for stopping it was driving piles in front of the headgates, and sheeting these in front with brush and canvas and bags of sand, by which means the water was eventually checked sufficiently to enable the headgates to be lowered.

The water was closed out of the power house sufficiently by Friday evening to allow an examination of the machinery, and work was at once started to get some of the generators again in operation. On the evening of the 29th, less than six days after the accident, one generator was sufficiently dried out so that with temporary wiring, which was arranged, about 1,500 kilowatts of power was supplied to Winnipeg to assist the overburdened steam plant. After this progress in reinstating the generators was made at the rate of one a day.

At Lac du Bonnet, Manager Phillips stayed with the work of repairs. All the cables in the building, from the generators and switchboard to the transformers and the switch cells, being in ducts below the floor, were found to be entirely soaked with water, and temporary wiring had to be installed to get the generators into operation after they had been dried. Operations were also hampered by the force of the water having broken the steam connections and done other damage of this character. In inspecting and testing the generators it was found that the most serious damage was near the point where the break occurred. Those farthest away were the least damaged. One generator had to be partially rewound on one side where it took the full force of the water and tore up the insulation.

The Lac du Bonnet plant has a somewhat unique record, as with this single exception its previous record was that there had been only a total shut-down of 25 minutes' duration in the three years since it commenced operations, which cannot be beaten, it is believed, by any other water power plant.

As to the cause of the accident, on examination of the gate rigging of No. 7 turbine, it was found that five teeth had been stripped from the hand wheel pinion on the governor, and in the opinion of experts when these teeth stripped the turbine gates were allowed to close very suddenly, and this caused the bursting of the penstock.

Telephone Department

A Typical Independent Telephone System

The Harrietsville Installation—Incorporation Explained—Useful Hints for Beginners—A Financial Success

By W. Doan.

We are incorporated under the Ontario Companies' Act, as a joint stock company of limited liability. The necessary instructions and blanks for forming such an organization are, upon application, supplied free of charge by the Provincial Secretary's office, at the Parliament Buildings, Toronto. Under this form of incorporation a stockholder has as many votes as he holds shares in the concern.

The company has been financed by placing the shares of stock at ten dollars per share, and all stock sold to date has realized par value, i.e., ten dollars per share to the company. The shares allotted to any subscriber of stock are settled for to the company by a single cash payment in full. The shares are not payable on the percentage plan. There are no preferred stocks and no bonds issued by the company. At the present time no stockholder is allowed to hold more than 100 shares in the company. This is done to prevent any one person from securing control of the organization. It has been generally necessary to find a local market for our independent telephone stocks and securities, but this, instead of being a detriment, has been a source of great strength to our enterprise, and while our company has been somewhat handicapped in the past on account of the narrow market, it gives a great guarantee of strength to know that the stocks are held by local people in sufficient quantities to at least give the balance of power to the home interests.

Since the beginning of the independent telephone business much has been learned, and any community now building, should build metallic (two wires), or they will be forced in the near future to remodel their system. The experience of all independent companies has been that they built too small and had to enlarge their plant before they really got started in business. Parts of our plant (pole lines) have been replaced with larger poles twice within the last three years. In building pole lines, have the poles set as near as possible in a straight line, and keep to one side of the road if at all passable. It is the end poles that want the most guying. If they give way, the whole pole lead will loose its proper bearings.

Cedar Poles are Best

Cedar poles give best general satisfaction, and will last about 12 to 15 years in service, if cut from live timber and properly planted and guyed. Since placing on every tenth pole a lightning rod, made of No. 9 wire stapled on the side of the pole and having the rod extend to the top of the pole, we have suffered very little from the effects of lightning. In fact, not had to replace a single pole slit by lightning. Up to and including a six-wire line, we now use side blocks. By this method the wires are all close to the poles, and the poles are not subjected to so great a strain as would be the case if a six pin cross arm were used. The line is stronger without the cross arms and looks just as neat. When over six wires are required, cross arms have been used and transpositions cut in as required to overcome cross talk.

Before being justified in building, a company should be assured of an average of at least two telephones to the mile. Good service cannot be given to rural sections with more than ten or twelve to a party line. Five bar bridging telephones, with 1,600 ohm ringer, and push button to call central, have been found to give us best service on rural party lines. This type of telephone has become very popular with us on party lines using metallic circuit, which terminates in a switchboard drop. With this arrangement a subscriber can ring any other subscriber without calling central, or can ring central without disturbing any of the other subscribers on the line. When a subscriber wishes to call central he pushes the button and calls in the usual way. When calling a subscriber on his own line the button is not used. If this type of telephone is used it is necessary that the switchboard drop should be connected by one terminal to the sleeve side of the line and the other terminal of the drop should be connected to the ground. Using this arrangement the central is called over one side of the line to ground, while the subscribers, however, will always talk "full metallic."

Original Equipment Often too Small

With a system of over twenty subscribers, it is necessary to establish an exchange or central office. Again I would repeat that careful consideration as to future growth should be taken into account when purchasing a central office equipment.

It is well to have the board wired for full capacity, but only the number of line equipments required installed. At least ten cord circuits should be installed in a fifty line board. Also a night bell should be placed in the board and proper provision made for the use of a pole changer, when the exchange has so increased in size as to make ringing by the magneto, a burden on the exchange operator. Another thing of vital importance is the protection of the central equipment against lightning and electrical currents of various kinds and strengths. This is usually done by installing two arresters, one in the cable pole box and the other in conjunction with the cross connecting terminals of the switchboard.

Our company owns all switchboards and outside construction, but each subscriber buys his own telephone. A yearly rental of $9 is charged each subscriber ($4.50 half yearly in advance) for the use of the company's lines, and the company keeps the subscribers' telephones in repair. We have always come out on the right side of our accounts at this rental, but any company should be very safe at $12 annual rental to subscribers on rural bridging party lines. Our annual dividend, so far, while not large, has been six per cent., and we are placing by a small amount annually into the reserve account to meet depreciation as it occurs.

Montreal and Eastern Canada

Personal

Mr. C. F. Medbury, manager of the Quebec district for the Canadian Westinghouse Company, Limited, was in Hamilton during the past month attending a manager's meeting.

Mr. Ralph D. Mershon, consulting engineer, 60 Wall street, New York, recently opened up a Canadian office at 33 Street Railway Building, in charge of Mr. Harry L. St George.

Mr. E. B. Fewing, of the Galt Electric & Gas Fixture Company, of Galt, Ont., was in Montreal recently, and it is understood completed arrangements with Mr. Irving Smith for the transfer to his company of a considerable portion of the stock of the R. E. T. Pringle Company, in liquidation.

Mr. Edward A. Evans, the recently appointed chief engineer of the Quebec Railway Light, Heat & Power Co., whose photo appears in this issue, was in Montreal recently. He expects that his company will make some extensive improvements to their power equipments during the present season. No announcement has yet been made regarding the personnel of those who will form the permanent engineering staff of the new company.

Mr. Lawford Grant, manager of the Canadian British Insulated Company, Limited, is at present on a business trip through Western Canada.

Mr. W. D. Kelsch, formerly superintendent of construction for the Montreal Light, Heat & Power Company, has been placed in charge of the construction work for the McCall Ferry plant, associated with Mr. J. A. Walls.

Mr. B. G. McNabb has been appointed manager of the new business department of the Montreal Light, Heat & Power Company.

Mr. E. A. Evans.

Mr. John S. Norris, whose appointment to fill the newly created position of general manager of the Montreal Light Heat & Power Company, has just been announced, was born in Montreal 35 years ago. In 1896 he commenced his career with the Power Company in the capacity of stenographer, later on becoming private secretary to President Holt. When in 1901 the amalgamation of the various light and power companies was effected in the Montreal district, and the present company reorganized, Mr. Norris became more actively connected with the management and executive work, and in June, 1906, was promoted to the position of secretary-treasurer to the company. Up to the present time Mr. Norris' field of operations has been most largely confined to the gas branch of the company's business, but in the future he will have charge of all matters pertaining to the general welfare of the Montreal Light, Heat & Power Company, a task that will call for the exercise of his greatest executive ability.

Mr. J. S. Norris.

Mr. R. M. Wilson, recently appointed as chief engineer to the Montreal Light, Heat & Power Company, is probably one of the youngest men in Canada occupying a similarly responsible position. Mr. Wilson was born in Montreal 36 years ago, and his record in the business world shows an unbroken connection with the electrical trade. In 1892 he entered the employ of the Royal Electric Company, and there gained his first practical knowledge of the mysteries of things electric. In time he worked through the various branches of the company's business, holding the position of erecting engineer, and was also in charge of the operating and testing departments. In the meantime Mr. Wilson did not neglect the opportunities which McGill University afforded for obtaining a technical education, and in 1899 he graduated with the degree of B.Sc. and with honors in electrical engineering. When several of the directors of the Royal Electric Company established the Chambly Manufacturing Company, to supply light and power to Montreal, Mr. Wilson was transferred to the new field as assistant superintendent of the operating department. Later on, when this company was taken over by the present consolidated interests, he became assistant to the general superintendent of the Montreal Light, Heat & Power Company. Next in order came his appointment as superintendent of all stations, which was followed by his promotion to be general superintendent for the company, a position he held until his directors recently conferred upon him the office of chief engineer. Mr. Wilson is a past vice-president of the Canadian Electrical Association, and a member of both the C.S.C.E. and the A.I.E.E. His new office carries with it the responsibility for all engineering matter pertaining to the steam, hydraulic and electrical operations of the Montreal Light, Heat & Power Company.

Annual Bauquet Quebec Electrical Association

The Montreal electrical fraternity came together in right genial style at the annual banquet of the Electrical Association of the Province of Quebec on Wednesday, Jan. 12th, 1910. For the occasion St. Lawrence Hall was transferred into an electrical fairyland—a tribute to the efforts of the Association's able executive.

Mr. R. M. Wilson.

President E. W. Sayer occupied the chair and made a very satisfactory master of ceremonies. By his side was placed the control button of an elaborate buzzer system which extended the length of the tables and created no little amusement.

The guests present included Mr. Alcide Chausse, City Building Inspector; Mr. J. N. Arcand, president of the Builders' Exchange; Mr. John H. Garth, of the Garth Company; Mr. James Bennett, Chief Electrical Inspector of the Canadian Fire Underwriters' Association; Mr. E. H. Ware and Mr. J. H. Lauer. A letter was read by the secretary voicing the regret of Thos. A. Edison, who could not be present, owing to absence in Florida.

The first toast of the evening, "The King," was fittingly honored, being drunk from a specially designed glass, which consisted of a glass insulator mounted on a wooden base.

In proposing the toast to the electrical manufacturers, Mr. Clarence Thomson produced his speech in the novel form of a tape roll "guaranteed to stand a breakdown test of 10,000 volts." Mr. Thomson's scroll contained much interesting advice, among other things, he said, "co-operation is the life of trade. We are living in a glorious country, a country with a present and a future." Continuing, Mr. Thomson advocated the getting away from price-cutting, which has been very detrimental to every business man's reputation. "We want manufacturers to get fair prices—we all want fair prices. There is a large enough market for all, and if you manufacturers want to see how you can share it satisfactorily and yet each get all the plums—join the Electrical Association, Province of Quebec."

Mr. R. J. Hiller, of the Canadian General Electric Company, and Mr. J. Walker replied on behalf of the manufacturers, Mr. Hiller dwelling at length on the necessity for cooperation and adhesion between the various branches of the electrical trade in Canada.

"Our Guests," proposed by Mr. C. G. Matthews, was replied to by Mr. J. N. Arcand and Mr. James Bennett. The latter gentleman eulogized the Association, which he termed "a child he was always interested in." He appreciated the co-operation of its members. They were using good material, were doing good work, and were getting good results. Montreal was not behind any city in the character of its contractors, and he said this from experience. His Association, he stated, was working for the general improvement of electrical contractors. In concluding, Mr. Bennett pointed out that Mr. Goddard, of Boston, and Mr. Proule, Commissioner of Wires for Boston, after a recent visit to Montreal had noted an immense improvement in the wiring conditions.

"Our Association" was first spoken to by First Vice-President Rubenstein, who outlined the splendid growth of the Association from its formation about one year ago. They had done much to promote a better feeling among Montreal contractors and jobbers, and outside contractors were also enquiring about the workings of their Association.

Mr. W. B. Shaw, the Association's affable secretary, followed, and Vice-President Valois replied in French. Mr. J. H. Lauer, secretary of the Builders' Exchange, spoke to this toast and advocated the establishment of an examination for electrical contractors.

During the waiting intervals an excellent musical programme was rendered by Messrs. D. M. Irons, E. H. Pickard, A. MacConnell, R. J. Hiller and J. A. Lachâpelle. "Doc" Ware and his card stunts were also very much appreciated. An efficient orchestra was in attendance during the evening and contributed largely to the pleasure of the guests.

The 1910 dinner was at the conclusion voted a huge success by all present, and credit must be duly given to President Sayer and his energetic dinner committee, consisting of Messrs. W. B. Shaw, M. Rubenstein, C. G. Matthews,

Quebec Electrical Association Banquet.

Clarence Thomson, C. J. Young, J. A. Lachapelle, L. Rousseau, N. Simoneau and J. A. Valois.

Among those present were: John H. Garth, the Garth Company; James Bennett, Chief Electrical Inspector of the Canadian Fire Underwriters' Association; Alcide Chausse, City Building Inspector; Chas. Duncan, F. C. Jamieson, the Duncan Electrical Company, Limited; R. J. Hiller, Harry L. Etienne, A. Montabone, J. A. Fletcher, the Canadian General Electric Company, Limited; Wm. B. Shaw, Fred. A. Newbury, the Montreal Electric Company; E. W. Sayer, E. Decelles, the Sayer Electric Company; C. J. Young, A. MacConnell, Henry Morgan & Company, Limited; J. Mochon, Allis-Chalmers-Bullock, Limited; M. Rubenstein; J. M. Walkley, J. M. Walkley & Company; F. J. Parsons, McDonald & Willson; Reg. I. Smith, Irving Smith; John C. Mace; J. Walker, R. E. T. Pringle Company; S. W .Smith, C. F. Cowper, Engineering Equipment & Supply Company; W. H Reynolds, the Eugene F. Phillips Electrical Works, Limited; J. A. Valois, the Chambly Electric Company; J. Ryan, Packard Electric Company, Limited; L. Rousseau, Canada Electric Company; Fred Thomson, Clarence Thomson, H. A. McPhee, Fred Thomson & Company; C. G. Matthews, Electric Repair & Contracting Company; D. McQuaid, Jr., the Century Electric Company; J. O. Lachapelle, Eastern Electrical Engineering Company; J. A. Hicks, the Hicks Electric Company; Matthews Kinniburgh, Dawson & Company, Limited; W. W. Mount, Kings Electrical Works, Limited; C. Jackson, the Montreal Current Saving Company; N. M. Lash, the Bell Telephone Company of Canada; Emile Lionais, N. Simoneou Electric Company; J. H. Lauer, secretary Builders' Exchange; J. A. Gagnon; A. B. Ware, the A. B. Ware Advertising Company; C. C. Bothwell, "Canadian Electrical News"; C. Lapierre; D. M. Irons; F. F. Peachy; E. Trottier; E. H. Pickard; Alfred Woodley; J. R. Painchaud; J. N. Arcand, president Builders' Exchange.

The health of one of Canada's pioneer electrical men was fittingly proposed and honored during the evening. This was Mr. Fred Thomson, of Fred Thomson & Company, who came to Montreal Jan. 12th, 27 years ago. Electricity was little known in this country in those days, and it has been Mr. Thomson's privilege to witness a wonderful development of the electrical trade of Canada.

Current Notes

We have been favoured with a copy of Mr. Harry D. Bayne's "Suggestions for 1910." The suggestions this year are very cleverly thought out and, as usual, are much sought after as a mural decoration by Mr. Bayne's many friends.

The Engineering Equipment & Supply Company are now located at 110 St. James street, in much better lighted and larger quarters. "We are growing some"—according to the genial manager, Mr. S. W. Smith.

The Montreal Star Publishing Company recently installed a 150 k.w. direct current generator supplied by the Allis-Chalmers-Bullock, Limited, and direct connected to a Leonard four valve engine. They have also installed an Allis-Chalmers-Bullock Teaser equipment to drive their new Hoe Sextuple press. This press has attached a color deck, and is the largest rotary printing press in Canada.

The Canadian Westinghouse Company, Limited, have recently supplied through their Montreal office, street railway equipments to the Montreal Street Railway Company, the St. John, N.B., Railway Company, and the Montreal Southern Counties Railway, in the last mentioned case the equipments being for use on snow plough cars.

The fire in the Diamond Flint Glass Company's premises recently completely destroyed their factory building and the main portion of their apparatus. The factory was operated by electric power and the motors were recovered in a badly damaged condition There were two 250 k.w., two 30 k.w. and one 5 k.w. machine

The order for rebuilding the motors was placed with the Electrical Repair & Contracting Company, 119 Lagauchetiere street, and they are working both day and night to complete this work. Part of the restored motors have already been delivered, and the balance will be rebuilt by the first of February.

Mr. M. A. Sammett, of Montreal, has been appointed consulting electrical engineer for the B. & A. Asbestos Co. The company is erecting a mill at Robertson, Que., for the treatment of 250 tons of asbestos rock a day. The mill will be electrically operated and the equipment will consist of 350 h.p. induction motors of various sizes.

The Berlin Asbestos Company, of Robertson, Que., are equipping their new mill with an electric motor drive. The electrical machinery on order for the company amounts to about 650 h.p., in three phase, 2,200 volt induction motors of the 60 cycle type. The electrical work is under the supervision of Mr. M. A. Sammett, the consulting engineer of the company.

On January 21st an important contract was let by the Montreal Light, Heat & Power Company, namely, a contract for the supply of 300,000 duct feet of conduit, which went to the Standard Vitrified Conduit Company, of New York. The company are planning this year to take down 62½ tons of overhead copper wire and to lay between 65,000 and 70,000 feet of underground cable. It is expected that an outlay of nearly $200,000 will be required for this work, which will be expended chiefly in the eastern end of the city.

The Montreal Light, Heat & Power Company, of Montreal, has made the following appointments: Mr. J. S. Norris to be general manager; Mr. R. M. Wilson, chief electrical engineer; Comptroller, Mr. H. R. Lyons; Assistant Secretary-Treasurer, Mr. C. S. Bagg. Mr. J. E. Aldred, president of the Shawinigan Water & Power Company, was elected to the vacancy on the board of directors.

Mr. W. N. Dietrich, consulting and erecting engineer, 16 St. Sacrament street, has been awarded the contract for the complete electric wiring and installation of a telephone system in the new addition to the Algonquin Hotel, at St. Andrews, N.B. Last year Mr. Deitrich installed the power plant and lighting system in the hotel laundry building and also wired the present hotel and surrounding C.P.R. cottages. Tungsten lamps were installed at that time, superceding the acetylene gas lighting, and have since proven very satisfactory, the heaviest breakages to the lamps having occurred during transit.

Shawinigan Extensions

The Shawinigan Water & Power Company, through their chief electrical engineer, Mr. Julian C. Smith, have recently placed the following orders for new equipment: Canadian General Electric Company, Limited, two 2,220 k.w., three phase, 50,000 volt transformers, for installation in their transformer station at Shawinigan Falls, and one 2,000 k.w. three phase transformer for installation at the south cable house, Three Rivers, Que.; Canadian Westinghouse Company, Limited, one 3,000 k.w., three phase transformer for the north cable house, Three Rivers, Que.; one 4,000 k.w., three phase transformer for installation in the Montreal Terminal substation, and one 3,000 k.w. generator for their Shawinigan power house.

The new substation of the Shawinigan Water & Power Company at Black Lake, is rapidly nearing completion.

The 8,000 k.w. Westinghouse generator direct connected to an I. P. Morris horizontal turbine, was recently tested and placed in operation in the Shawinigan Falls power house of the Shawinigan Water & Power Company.

The Shawinigan Water & Power Company have under construction a new transmission line between Three Rivers and Nicolet, Que., a distance of nearly 25 miles.

Vancouver and Western Canada

Installation of 600 H.P. Auxiliary Steam Plant—Rapid Telephone Extensions—Electrical Business very Active—B. C. Electric Railway News

Fifty passenger cars, in addition to a large number of freight cars, were constructed last year in the British Columbia Electric Railway shops at New Westminster. At present there are twenty passenger cars and five freights nearing completion.

The new office building of the B. C. Electric Railway, to be constructed on the site of the old building at the corner of Carroll and Hastings streets, Vancouver, will be an ornament to the city. The competitive plans already in have been rejected as unsuitable, and new ones are in course of preparation.

The B. C. Electric Railway station at Chilliwack is to be solid concrete, and will cost $23,000. The terminals of the tram line at that point will be extensive, covering about 15 acres.

The large sum of $315,000 will be expended on the New Westminster branch of the B. C. Electric Railway during the present year. The money will go to pay for new cars, double tracking of Columbia street, and other improvements, including the erection of a handsome new station and office home costing $60,000 or $70,000.

The many new cars to be turned out this year for the British Columbia Electric Railway's Vancouver equipment will be of an entirely new type, permitting of the exit of passengers by way of the front platform. This will do away with the present objectionable crowding caused by the meeting of incoming and outgoing passengers. A number of the cars will be of the pay-as-you-enter type.

At a recent conference of the managers of the various branches of the B. C. Electric Railway Company with General Manager Sperling, following the return of the latter from consultation with the shareholders in England, the car-building programme of the company for 1910 was mapped out, and proves to be an extensive one. Five powerful electric locomotives and 100 freight cars will be ordered for use on the new Chilliwack line and present interurban branches. The growth of traffic in Vancouver calls for 38 double truck passenger cars of the latest type. Some of the new equipment will be constructed at the company's New Westminster shops, which are to be greatly enlarged, the balance being contracted for by outside firms. The total outlay in this department will be in the neighborhood of half a million dollars.

At least ten miles of new car lines will be constructed in South Vancouver and Point Grey municipalities by the B. C. Electric Railway Company within the next five years. At least two of these lines will run direct from the heart of the city throughout the length of thoroughfares which will become great arteries in the transportation system of Greater Vancouver. The trio of southerly lines will be laid on Granville, Bridge and Oak streets; a trunk line will also be constructed eastward from Granville street to Westminster avenue along King Edward avenue, which is the southerly boundary of Shaughnessy Heights. The plan is the outcome of a recent agreement made between the C. P. R. Company and the B. C. Electric Railway Company, which provides for an extension of the lease of the Vancouver & Lulu Island Railway by the former company to the latter for a period of 21 years from last October, with the option of renewal for a like period. The construction of the new car lines will open up a large area of exceedingly valuable residential property.

The new auxiliary plant to be installed by the B. C. Electric Railway in Vancouver will be the most modern of its kind. Six Babcock & Wilcox boilers, each of 1,200 h.p., are now en route from England, and will be equipped with Wheeler condensers and the latest circulating pumps. The boilers will be stoked with automatic machinery direct from the bunkers, which will have a capacity of 400 tons, or two days' supply. False Creek, back of the new plant, will be dredged to allow heavily laden coal barges to discharge directly into the bunker conveyors. An enormous chimney built of reinforced concrete, eleven feet in diameter and 250 feet in height, will eliminate any possible nuisance from the smoke of the furnaces. The contract calls for the completion of the work by April, and a large bonus is offered the contractors to stimulate them to do better if possible. When the plant is handed over, fires will be kept under the boilers continually, so that steam can be raised at an instant's notice and so avoid a repetition in Vancouver of Winnipeg's recent dismal experience. Two 3,000 h.p. Parsons turbo-electric generators will be installed by the Allis-Chalmers-Bullock Company, of Milwaukee, Wis., and Vancouver; these will be in place about the end of February.

Lighting System on Granville Street Bridge, Vancouver.

Mr. J. A. McCrossan has been re-appointed City Electrician of Vancouver, succeeding Mr. McCullough, who resigned the position on January 1st, after a year's service. The new appointee is well versed in the duties, having occupied the position for a number of years prior to engaging in private business.

The British Columbia Telephone Company's cable to Vancouver Island, which parted during the heavy storms early in December, was repaired recently by the cable steamer "Restorer." The cable was stretched between Telegraph Bay and San Juan Island, and at the point of breakage passed over a submarine cliff. The rubbing of the loop against the rocks frayed the strands and eventually caused a fracture. The Western Union Telegraph Company's cable to the island having become interrupted in August, for a time the sole means of communication by wire between Vancouver Island and the mainland was via the C.P.R. telegraph line.

The citizens of Prince Rupert, B.C., are feeling happy because of a loan of $50,000 from the Provincial Legislature for the acquirement of the pole line of the Prince Rupert Power & Light Company and for the construction and installation of proper buildings and plant for the supply of electric light and power. The loan will be repaid with incidental charges so soon as Prince Rupert shall become an incorporated city, with usual tax-levying and collecting powers.

Telephone Links Alberta to British Columbia

The Provinces of British Columbia and Alberta are linked up electrically by means of the extension of the Alberta Government long distance telephone system through the Crow's Nest Pass to a junction with the Kootenay Telephone Lines, Limited, service. One may now speak from almost any part of British Columbia with another person in almost any part of Alberta, and in the spring—following the completion of other extensions under way—it will be possible to call up Spokane and all points in northern Idaho, Washington and the boundary country. The Kootenay Telephone Lines, Limited, now has 500 miles of first class line, with 75 toll stations and two exchanges—at Cranbrook and Fernie—and in addition has connection with all the lumbering and mining camps in East Kootenay.

Cranbrook Power & Light Company has applied to the Legislature for permission to develop power from St. Mary's river, in East Kootenay.

Naylor Brothers, the old country firm which had the contract for the enlargement of the hydraulic tunnel between Lakes Coquitlam and Buntzen, have made a friendly assignment of the uncompleted work to the B. C. Electric Railway Company, who will complete the tunnel with all possible speed in order that they may secure the additional power required for the operation of street cars on the many extensions of their system.

Nelson to Have Street Railway

The ambitious city of Nelson, B.C., is to have a street railway. A company has been formed and work will be proceeded with in the early spring. The promoters have placed an order with Allis-Chalmers-Bullock, Limited, of Vancouver, for one 250 k.w. motor generator set, and two 4 motor 50 h.p. car equipments. Other orders will be placed later.

The C. C. Moore Company, of San Francisco, contractors for the B. C. Electric Railway Company's $250,000 auxiliary substation on Dufferin street, Vancouver, have placed an order with Allis-Chalmers-Bullock, Limited, for two 2,000 k.w. steam turbines, three phase, 60 cycle, 2,300 volt type, and two 50 h.p. motors for operating the condensing pumps. May 1st has been named as the date for delivery.

The Clayburn Brick Company, of Clayburn, B.C., will operate its machinery by electricity hereafter, the intention being to double the present output. A contract has been entered into with the Allis-Chalmers-Bullock people, of Vancouver, to supply one 200 h.p. motor, four 40 h.p., one 20 h.p. and two 10 h.p. motors.

The Pacific Coast Wood Pipe Company, whose large plant is located near Granville street bridge, Vancouver, will shortly install electric drive equipment for the woodworking machinery. The plant will comprise two 20 h.p. motors, one 15 h.p. and one 3 h.p. The large and constantly increasing demand for the company's product rendered additional power a necessity, and the introduction of electricity will accomplish the result aimed at. The motors will be of the Allis-Chalmers-Bullock type.

Tungsten Lamps in Vancouver Streets

A movement is under way to introduce a new system of street lighting in Vancouver, to replace the present crude and old fashioned plan of arc lights suspended from tall wooden poles. The property owners on Granville street some time ago petitioned council to install the tungsten system of five large bulbs on sightly iron columns 18 feet in height and 100 feet apart—resembling the Seattle plan somewhat. Hastings street property owners then became interested in the proposition, and were followed by the owners of a number of blocks on Westminster avenue. The system would call for three sections, 100 light columns for each. For the supply of electric current the B. C. Electric Company made a tentative offer of $6,000 per annum per section, but this will likely be reduced when the matter is gone into more carefully. The Electrical Construction Company have the wiring contract for the Granville street section, and may be given the Hastings and Westminster avenue work if proceeded with.

The Canadian General Electric Company, of Vancouver, have acquired a site on Pender street west for a new office building, work on which is now under way. It will be of mill construction reinforced concrete type, five storeys, and will combine all the latest improvements. Messrs. Honeyman & Curtis are the architects, the workmen employed being in charge of the company's building expert from Montreal. The Electrical Construction Company, of Vancouver, have the contract for the electrical fittings.

Owing to the large amount of building under way in Vancouver the various electrical firms are exceedingly busy. Messrs. Cape & Son and the Hinton Electrical Company have a number of large contracts on hand, and the smaller firms report all the business they can handle. The opening of the spring building activivty will find every available electrician working overtime.

Mr. J. Read, manager of the Vancouver branch of the Canadian Westinghouse Company, returned a few days ago from eastern Canada, where he spent some three weeks visiting friends.

The Vancouver office of Allis-Chalmers-Bullock, Limited, has been removed from Seymour street to the Dominion Trust Company's magnificent new building, Suite No. 812.

Fires Rarely Caused by Defective Wiring

The following letter has been addressed to the "Electrical News" on a subject of extreme importance and by one fitted to discuss the various aspects of the case. The question of defective electrical wiring is one that is occupying the minds of many interested individuals and companies at the present moment, and we have pleasure in giving all prominence to Mr. Ginder's views.

Hamilton, Ont., Jan. 19th, 1910.

Editor "Electrical News":

Dear Sir,—As managing director of the Canadian Tungsten Lamp Company, a company handling daily immense quantities of electrical current, I might, without presumption, think that I know something of the dangers (?) from fire by electricity. I have carefully watched for some years the reports of the fire commissioners from different parts of this country as regards the causes of fire. A few years ago the verdict was that 90 per cent. of the fires were caused from overheated stove pipes or defective flues. In the course of a few years a wonderful change has taken place; now Canadian commissioners find that 90 per cent. of the fires are caused "from defective wiring."

The London County Council in their report on fires stated "that out of the total number of fires in the city of London, numbering, during the year 1908, 3,400, not one was caused by electricity in any form."

The fire hazard from electricity is not only over-rated but entirely misunderstood by the different fire commissioners in this country. I think it about time that the electrical trade took a hand in dispelling this prejudice.

Yours very truly,
The Canadian Tungsten Lamp Co., Ltd
(Signed) W. H. Ginder, President.

Questions and Answers

Q.—I am using a standard type of meter, but some of them are causing my customers annoyance on account of considerable humming. What can I do to stop this?

A.—Any reliable firm will thank you to return a humming meter, and will willingly replace it by a satisfactory instrument. It is probably due to a slightly faulty construction and you could do nothing yourself, we think, to relieve the trouble.

Q.—I would like to know the nature and effect of a "booster" in a power circuit?

A.—Your question is not easy to cover in a limited space. Supposing the case first of a d.c. power circuit, without a storage battery, if the booster is installed at some distant point on the line, with the object of maintaining a constant voltage, the results cannot be considered satisfactory, as if the line loss is so great that it is necessary to boost the voltage, the addition of a booster will only increase this loss by adding to the already overloaded line its own losses. Besides this, by raising the line voltage, the ampere consumption of the various apparatus installed is likely to be increased, which will further increase the line loss.

If, however, the booster is installed in connection with a storage battery, extra demands for power may be made to come from the storage battery, instead of the line, thus keeping the line drop at a fairly steady point, depending on the average load for 24 hours.

A booster installed at the power house, feeding into the system at a distant point over a special booster feeder, is often used, with fair results, in connection with street railway circuits, but it cannot be recommended, except for temporary work, or wherever power is very cheap, as the whole output of the booster is lost in the line, making the net efficiency of the system very low.

Q.—(a) Will you please explain fully in your next issue the meaning and relation of the "power factor" in an electrical load, giving its effect on the readings of three phase instrnments as regards net output of power, obtained from summing the three readings and equalizing them? (b) Kindly give the official method of obtaining the h.p. from the three readings in three phase current?

A.—(a) The power factor in alternating current work may be defined as that factor by which it is necessary to multiply the watt meter reading, or apparent watts, in order to obtain the true wattage or power reading for the circuit. This may be further explained as follows:

In direct current P= E.I, where P=power in watts, E=e.m.f. in volts, I=current in amperes. In a.c. circuits the instruments give you the square root of the mean square of the instantaneous values of the current or voltage as the case may be. Now, if the current and voltage do not reach maximum and zero values at the same time, then the P=E.I relation does not hold true, and some factor must be introduced to give us a relation between P, E and I.

Thus we can say P=E.I cos a, and "cos a" is the term called "power factor." It is derived as follows: Divide a complete cycle of voltage into 360 degrees, which would correspond to one complete revolution of a two pole, single phase alternator. Assume the two pole machine to be operating and at a particular instant the voltage across the armature windings is a maximum and if the load be inductive the current will not reach a maximum until the armature has revolved through a certain angle. This is the angle "a." It can be proved by the use of vectors and geometry that the cosine of "a" is the factor which, multiplied by the product of current by voltage as read on the instruments, will give the power delivered by the machine. With regard to three phase circuits the same relation holds. That is to say, that the apparent three phase power multiplied by the power factor of the load gives the real power. The general effect of a low power factor is to increase the amount of current in the line, i.e., if a line carries 10 amperes at 100 per cent. power factor at a certain load and voltage, for the same voltage and load with 90 per cent. power factor the current is increased to 10/9×10=11 1/9 amperes.

(b) Only an approximate estimate of the horse power can be obtained from the three readings in three phase current. The following formula will give it: The average current in the three legs multiplied by 1.732 multiplied by the voltage and this divided by 746. To obtain the true watts this result must be multiplied by the power factor of the circuit. The usual method of obtaining the horse power is by the use of the two wattmeter method or by employing a polyphase wattmeter.

Q.—(a) Kindly inform me through your paper what the effect would be, if any, on the lights of a town situated at the end of a transmission line, if a station about 30 miles from the generation station, using 8,000 h.p., suddenly dropped off 500 h.p.? (b) What would be the effect on the lights if an 800 h.p. induction motor with starting compensator were thrown into circuit? If there is any difference how may it be overcome? The power is not changed through any apparatus other than transformers. The line voltage is 30,000 and it is supposed to have ample carrying capacity?

A—(a) & (b) The effect of suddenly dropping 500 h.p. off at this substation would without doubt raise the voltage on the line and as a result the lights on the town circuit would fluctuate until the voltage was readjusted at the main station. This would also be the case when staritng up the 800 h.p. motor. The only difference being that the voltage in the latter case would be lowered to a certain extent and the lights on the town circuit would burn somewhat less brightly. It is absolutely impossible to give you detailed information or advice unless we had at hand fuller information concerning the capacities of the main generating station and full data concerning the layout of the plant. This would appear to us to be a problem for you to take up with a consulting engineer and obtain his report upon the situation.

Q.—What is considered the proper size for a neutral wire in three wire work? What sized conduit should be used for three No. 0 wires?

A.—For single phase or direct current three wire work the neutral theoretically need be only just large enough to carry the unbalanced load, for instance, a No. 14 would be quite sufficient to carry an unbalanced load of 5 amperes, assuming not too great a distance, even though the load on the outside were heavy enough to require a No. 0. Practically though, this is never done, the neutral always being made at least 5 per cent. of the two outsides. Sometimes it is made the full size, in which case one side of the system can be cut out entirely and the other still carry full load with normal drop. Then occasionally the neutral is made twice as large as the other two, so that by the use of a breakdown switch the whole system can be converted into a two wire plant, and the whole load carried by one side with the usual drop. In three wire two phase systems the neutral should be 140 per cent. of the two others. Three No. 0 conductors will require a 1¼ inch conduit, but they should be cable, not wire.

Personal Mention

Mr. Eugene Creed has been appointed assistant sales and advertising manager of the Toronto Electric Light Company, Limited.

Mr. F. H. McGuigan has been elected president of the St. Lawrence Power Company, Limited, operating at Cornwall.

Mr. H. A. Shambrook has been appointed local manager for the C.P.R. Telegraph Company, succeeding D. G. Sturrock, who has resigned owing to ill health.

Mr. Karl Wildern, manager of the Woodstock branch of the Bell Telephone system, has been promoted to the position of manager of the company's branch at Windsor.

Mr. A. A. Smith, formerly local manager for the Bell Telephone Company at Collingwood, has been appointed manager of the Peterborough section, with Mr. F. W. Doan as superintendent of the district.

Mr. H. H. Macrae.

Mr. Hubert H. Macrae, until recently manager of the Electrical Development Company of Toronto and Niagara Falls, has accepted the position of general manager of the Toronto Electric Light Company. The new manager brings to his work a wide experience in both legal and practical administrative work, having been engaged first in a legal capacity in connection with the installation of the Electrical Development System and later having successfully filled the position, for a number of years, of general manager. The Toronto Electric Light Company is to be congratulated that its general business will be under the control of so efficient an officer.

Mr. W. S. McKibben, for some time past representative at Rossland of the Canadian General Electric Company, who is leaving the Kootenay for Spokane, was recently honored with a complimentary banquet at Rossland, and presented by his friends with a number of reminders of their good will and regret at losing him.

Mr. J. F. B. Vandeleur, of Vandeleur & Nicholls, has returned from a trip to the British Isles, where he has been extending his business connections.

Mr. A. E. Klein has been appointed to the position of inspector of concrete footings on the new municipal transmission line connecting Point du Bois and Winnipeg.

Mr. Ernest Bruce, who has been in charge of the trouble department of the Peterborough office of the Bell Telephone Company for the last three years, has been appointed local manager at Collingwood.

Mr. J. J. Mason is chairman of the newly created light and heat commission of Stratford.

Mr. W. A. Martin, formerly secretary of the Toronto Electric Light Company, has been appointed to the position of assistant general manager.

Mr. W. E. Middleton, K.C., has been chosen to act as special counsel for the city of Toronto in the appeal on street railway matters before the Privy Council. Mr. Middleton will leave for England at once.

Dr. W. A. Burns has been elected chairman of the St. Thomas Board of Street Railway Commissioners.

Mr. P. W. Sothman, chief engineer of the Hydro-Electric Power Commission of Ontario, lectured recently before the Electrical Society of Queen's University on the subject of High Tension Transmission.

Mr. J. J. Wright, who has occupied the position of general manager of the Toronto Electric Light Company for some 27 years, practically since the company's organization, has been apointed second vice-president of the company. The management is to be commended for their efforts to retain a man of Mr. Wright's ripe and valued experience when the circumstances of increasingly heavy duties and advancing years would naturally have inclined him to retire to private life. Fortunately, too, Mr. Wright has been prevailed upon to occupy the position of consulting engineer, in which capacity his interests will be particularly devoted to the various electrical productions of the company. Mr. Wright's regime has been marked throughout the years by one steady advance in both the quality and quantity of the service his company has rendered to the city of Toronto, and we predict a continuation of this policy in the department to which the new vice-president will now devote his entire energies.

McGill University Items

Prof. Herdt expects to be in Winnipeg on February 15th to open tenders for the construction and equipment of the new terminal station, to be erected in that city in connection with the Point du Bois power development.

The 50 k.w. Westinghouse motor generator set installed in the mining building for the use of Dr. Stanfield in experimental furnace work has been placed in operation.

Mr. Hyde, of the engineering department of the Montreal Light, Heat & Power Company, delivered an interesting lecture to the Electrical Club recently.

Mr. R. A. Ross, of the firm of Messrs. Ross & Holgate, has once more consented to give a course of lectures to the 3rd and 4th year students, of the Faculty of Applied Science, McGill University, on the subject of "Engineering Economics." This is a very interesting and instructive course, dealing, as it does, with the broader development and training of the engineer, and it gives the students an excellent idea of their relation to various problems from the business and legal point of view, as well as from the purely technical. About 125 students are taking the course, and judging by their remarks it is a popular one and is filling a long felt want in the training of the young engineer.

Pro. R. W. Angus lectured recently before the Engineers' Club, in his new thermo-dynamics building, on the subject of "Turbine Pumps." The lecture was well illustrated by various types of pumps, whose internal structure, with points of excellence, was carefully explained.

Development and Operation of Hydro-Electric Plants

An important paper was read recently before the American Institute of Electrical Engineers on the subject of development and operation of hydro-electric plants. The author, Mr. Henry L. Doherty, dealing first with the subject under the subhead "Value of water power securities," claimed that, compared with almost every other class of investment, a water power plant is far preferable. Not only is the source of supply, in the main, perpetual, but almost every other class of industrial or investment property is apt to depreciate at a much greater rate, and be subjected to greater seen and unforeseen risks while, in reality, water powers tend to grow more and more valuable, since fuels upon which competitive power plants are dependent are not likely to cost less in the future than at present.

The interest aroused in the preservation of the water power resources of the United States is described as the greatest stroke of statesmanship of the last administration, though the efforts of the government in regard to water powers had either been misdirected or largely misunderstood. Government, both state and national, should remove as far as possible every unnecessary obstacle to water power development. Encouragement, and perhaps direction, should be given which will ensure the development of the greatest possible portion of the total energy available from the streams.

Among collateral enterprises is mentioned that of irrigation. Combination projects of both irrigation and power can be made highly profitable where commercial success for either alone would be impossible. Also electro-chemical processes promise in the near future to make many power developments profitable. Failure to realize expectations in regard to cost of development, amount of power to be used, existence of market or fair market price, etc., has played an important part in the retardation of development of water powers. There is no reason why anticipations should not be realized in water power as in other enterprises if the proper amount of investigation and preliminary work is done.

The author also discusses many matters of detail, methods and equipment to insure against interruptions, with penalties attaching in case of unsatisfactory service. The insurance may best be effected by means of an auxiliary steam plant. Taking the extreme case, for example, where only two interruptions a year are permissable, the steam plant must be run continuously for six months after every such interruption. A special case is cited where the length of time the auxiliary plant was operated depended on the duration of the interruption and on the number of interruptions that had occurred during the year previous. If the interruption in question was the first during said year, then the steam plant was run, at sufficient capacity to carry the load, ten days for the first minute (or less) plus an additional day for each additional minute of duration of interruption; the time of running for each succeeding interruption to be compounded 20 per cent. That is to say:

First interruption—
  10 days for 1st minute, plus 1 day for each added min.
Second interruption—
  12 days for 1st minute, plus 1.2 days for each added min.
Third interruption—
  14.4 days for 1st min., plus 1.44 days for each added min.
etc., etc.

Methods of calculating charges, of developing the market for power and of estimating depreciation are briefly outlined. The author considers the question of depreciation an important one. He believes, however, that practically all present assumptions for depreciation are too high. The character of the construction will largely influence the rate of depreciation. A plant having 10 p.c. of its investment in wooden poles and 20 per cent. in a masonry dam will have a higher rate of depreciation than the plant with only 2 per cent. of the total investment in wooden poles and 50 per cent. in a masonry dam. Therefore no standard of depreciation can be fixed, but each individual class of property should be given its own rate of depreciation.

The University of Toronto Engineering Society Dinner

The Engineering Society of the University of Toronto held their 21st annual dinner in Convocation Hall on Wednesday, Jan. 19. A pleasing feature of the dinner, as it was also a new one, was the inclusion of the Manufacturers' Association in the list of guests. The speakers of the evening included President Falconer, Dr. J. A. Macdonald, Mr. P. W. Ellis and Mr. J. P Murray, of Toronto, and Mr. Louis Simpson, of Ottawa.

Dr. Macdonald's theme was "Economy and Conservation of Natural and Material Resources" for Canadians themselves. He instanced the waste of wealth in England, where 80 per cent. of the land is owned by 3 per cent. of the population, who care nothing that it is unproductive, and appealed for the preservation, for the use of the people, of Canada's land and forests and water powers and minerals.

President Falconer outlined the value of university work in the development of our natural resources. No one faculty was more important than another, inasmuch as there were almost countless resources waiting for development and each faculty concerned itself mainly with only one of these. His appeal to the students on the ground that their future assistance and success in solving Canada's problems would be considered by outsiders as the justification or otherwise of university work, was very fine and much appreciated alike by students and guests.

Toronto Section A. I. E. E.

The Toronto Section of the American Institute of Electrical Engineers held their regular monthly meeting on Friday night, Jan. 21st, at the Engineers' Club, Toronto, with about 70 members and visitors present.

The paper of the evening was presented by Mr. P. M. Lincoln, consulting engineer, Westinghouse Electric & Manufacturing Company, Pittsburg, subject, "Recent Development in Electrical Engineering." Mr. Lincoln spoke at length upon the recent important developments in electrical engineering, dwelling particularly on the suspended type insulator, the now form of high tension bushings in transformers, the development in the use of low pressure steam turbines, and the increased use of the synchronous condenser for power factor correction. An abstract of the paper will probably appear in the next issue of "The Canadian Electrical News."

The reading of the paper was followed by an animated discussion which lasted until a late hour. The following gentlemen discussed Mr. Lincoln's paper: R. G. Black, K. J. Aitken, A. L. Mudge, H. U. Hart, C. A. Price, A. S. L. Peaslee, Harold Brown, Prof. Rosebrugh, A. J. Soper and others.

The February meeting will be addressed on the subject of "Water Power Plants," by Mr. Jens Orten Boving, of London, England.

According to Herr Koehn, says "The Electrical Engineer," of London, Eng., the available hydraulic power of Europe is distributed as follows: Austria, 6,460,00 h.p.; France, 5,857,000; Germany, 1,425,900; Great Britain, 965,000; Italy, 5,500,000; Norway, 7,500,000; Sweden, 6,750,000; Switzerland, 1,500,000.

The "Scoop" Tungsten Reflector

The amount of loss, or waste of light in the illumination of the average show window is extremely large. In the average case a 30 per cent. to 50 per cent. loss is probably a conservative estimate. This loss is due both to inefficiency of reflecting surface and to poor design of reflectors.

This inefficiency has not been entirely the merchant's fault, as window lighting has been one of his most difficult problems. Having no scientific engineering data to go by, a general "hit or miss" plan of installing any kind of reflector the merchant or the electrician thought would do, has been the vogue and it is safe to say that a very small percentage have been handled correctly. But illuminating engineering has made great advances during the past few years. Instead of wasting from 30 to 50 per cent. of the light generated, on the sidewalk, the ceiling and in the extreme top of the window, the light can now be concentrated where needed, thereby not only eliminating loss but greatly improving the effect on the goods displayed. Add to this the tungsten lamps, which give about three times the illumination, with a given amount of current, of the carbon filament lamp. These coupled with reflectors of scientific design, recently developed, illuminate the show window to best possible advantage from the standpoint of lighting efficiency, effect, and economy.

Reflectors already on the market have been made for the most part for extremely high windows (12 feet or over) and for quite low windows and handle the illumination economically. There has, however, been a great demand for an efficient reflector to illuminate the average sized window and to use with tungsten lamps. A recent development along this line is the "Scoop" reflector, so called owing to its peculiar shape (see figure). It is a one piece pure silver plated reflector, having a great efficiency and not only takes the lamp pendant, but is so designed that it will handle the rays of light correctly from the 40, 60 or 100 watt tungsten lamp. It is easily attached to the ceiling, an ordinary socket and crowfoot being used for this purpose, and in addition is comparatively inexpensive.

As will be noticed in the figure, the window side of this reflector comes in at a slight angle, which cuts the rays of light sharply at the lower window line, bringing the greater intensity of illumination just where required and decreasing in brilliancy the upper part of the back rim.

Th total mileage of electrical railways in Canada in 1909 was 989; the gross earnings for the yea rwere $11,828,936, and the net income was $4,716,308. The returns of accidents on electric railways show 68 persons killed and 2,139 injured.

Croftan Storage Batteries Meet with Favor

The town of Berlin has lately had a storage battery equipment installed for its fire alarm system. The battery formerly consisted of 48 gravity cells, and was replaced by 40 cells of type 3 "S" "Vulcan" storage battery. This provides a double set, and each set is capable of giving a week's service without recharging. A high resistance controlling rheostat is inserted in the main line so that a constant amount of current flows through the circuit at all times, which also makes provision for an increase should extra line wire be added. The cost of operating this system yearly will not exceed $50, as compared with the former yearly outlay of $200, irrespective of labor.

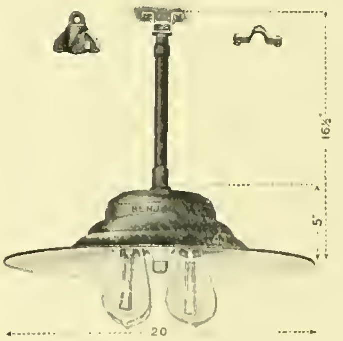
The above equipment was furnished and installed by the Croftan Storage Battery Company, who are furnishing a number of similar plants.

Dossert Solderless Connectors for Aluminium

The increasing use of aluminum wires and cables for power work has of late been the subject of much discussion. Some difficulty has been experienced in connection with making a perfect mechanical joint. The practice has been to fuse the ends together, this requiring a temperature of 1120 degrees Fahrenheit.

As this high temperature is not always available nor practicable, it will be of interest to all engineers and line superintendents to note that Messrs. Dossert & Company, of New York, have developed a line of their well known solderless connectors for use with aluminum cable. Already this company report several large orders for these connectors, and are prepared to handle any enquiries or to furnish data to all interested. Those interested should communicate with the company's sales agent, Mr. Irving Smith, 40 St. Antoine street, Montreal, who has instructive data bearing on the subject.

A New Benjamin Tungsten Fixture



A new tungsten fixture especially adapted for use in factories, shops and warehouses, is being placed upon the market by the Benjamin Electric Manufacturing Company. The accompanying cut illustrates the principal features, among which are the 20 inch porcelain enamelled steel reflector with 10½ inch inner reflector to assist in the downward radiation of the light, 8 inch stem of one-half inch iron pipe, and tungsten shock absorber. 40, 60, and 100 watt lamps may be used. In three and four light fixtures the sockets are vertical; in five and six light fixtures, at an angle of 15 degrees, thus permitting the use of larger units, and increasing the lighting efficiency by making it unnecessary for the light of one lamp to pass through the others.

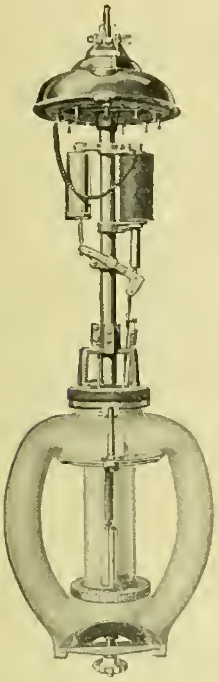
Further information may be secured by addressing the company's office, No. 64 York street, Toronto, Ont.

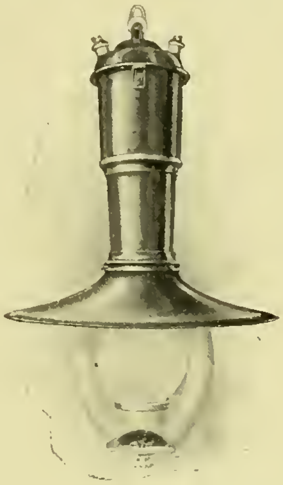
By an order of Council recently issued, the following appears among additions to the free list of the Canadian tariff: "Metallic elements and tungstic acid when imported by manufacturers for use only in their own factories in the manufacture of metal filaments for electric lamps."

The A. B. Regenerative Flame Arc

The A-B regenerative flame arc, illustrated herewith, is among the latest evolutions in arc lighting, although it has been in use abroad for some time. It produces the characteristic orange ray of the flame arc, with even greater intrinsic brilliancy, but should not be considered in any other sense of the word, a lamp of this type. The carbons are vertical, the upper 18 inches long and 5/8-inch in diameter, and the lower being 7 3/4 inches long and 7/8-inch in diameter. The upper is composed of nearly pure carbon, the lower of a core or centre, star shape cross section, the radial spaces being filled with a chemical composition which possesses the property of maintaining a brilliant orange ray independently of the presence of oxygen.

The lamp is provided with double globe, the inner one clear, the outer opalescent. The inner globe is open at both ends and communicates with the two side tubes, allowing a free circulation of gases within the globes, which rise, pass out to the side tubes, and return to the bottom of the globe, where, on becoming reheated by the arc, they repeat the cycle operation. The chemicals, in gaseous form, are thereby used over again, intensifying the light, and giving rise to the name "regenerative." The side tubes and the regenerative chamber are cast in one piece of aluminum and there are absolutely no shadows cast by them. The lamp mechanism is very simple and accessible, by means of the telescoping case, for adjustment and repairs. The resistance is contained in the top of the lamp and is of the well known A-B construction. Lamp cases of heavy rolled copper and aluminum castings are used wherever possible to reduce the weight. The height of the lamp over all is 41 inches and the weight complete, including the globes and reflector, is 40 pounds. The reflector is 24 inches in diameter, made of heavy steel, and fire enamelled both top and bottom. The managers claim an average life of 70 hours for time of carbon.





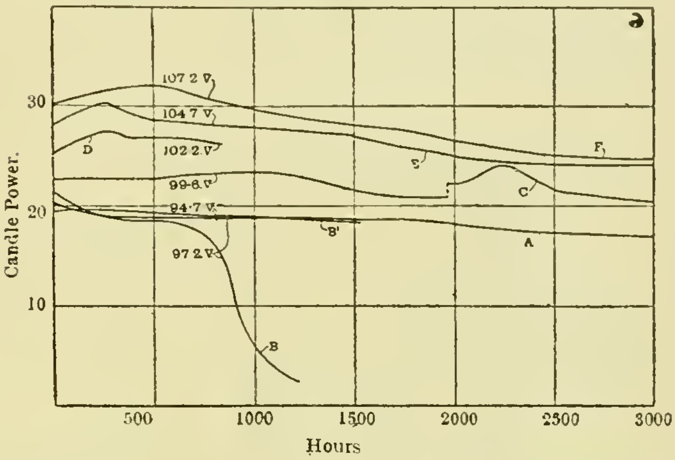
Mr. R. E. T. Pringle, of Montreal, will control the agency in Canada outside of Ontario.

Renewals for Canadian Carbon Company

The Canadian Carbon Company, Limited, Toronto, reports to the effect that the central lighting stations of Ottawa and London have renewed their year's contracts with them for 1910 for both carbons and inner globes. Their large factory, situated in France, is daily turning out about 700,000 carbons, a special type of which is being manufactured to suit Canadian conditions, which type is very apparently meeting the needs of the central stations.

Current Literature

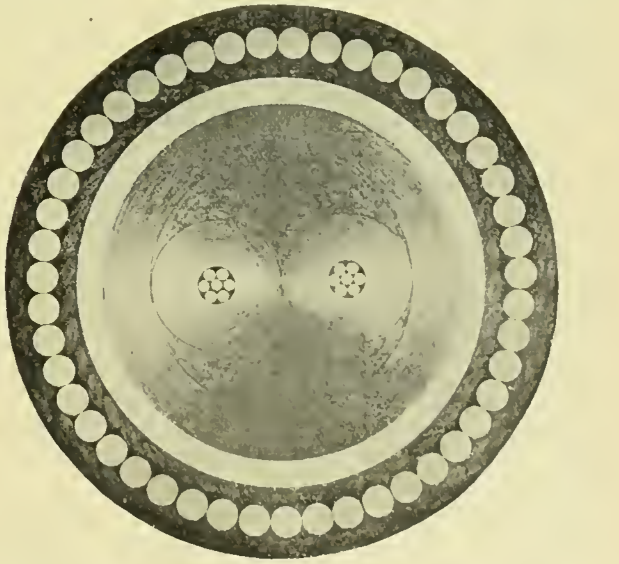
The following data is given in "Electrical Engineering" regarding some tests of the life curves of tungsten lamps. The lamps were rated at 100 volts and 32 watts, and were run continuously at the pressure given in the table below:



Lamp	Voltage	Life in hours
A	94.7	3,000
B	97.2	1,225
B1	97.2	1,500
C	99.6	3,000
D	102.2	850
E	104.7	3,000
F	107.2	3,000

The curve shows the drop in candle power with life, which, except in the case of one of the six lamps tested, is practically negligible during the first 1,000 hours. Curve C is interesting, the filament fractured after 1,970 hours, but was welded together again.

130,000 Volt High Tension Cables—What is believed to be a record in high voltage cables has recently been accomplished by Messrs. W. T. Henley's Telegraph Works Company, of Blomfield street, London, E.C. The cable under notice is a 0.02 square inch circular twin cable, which is insulated with impregnated manila paper and then lead sheathed and wire armored. The accompanying illustration is a full size view of this cable. It was manufactured for the Marconi's Wireless Telegraph Company, for use at their Clifden and Glace Bay



stations, and is to be employed to convey current at the very high pressure of 40,000 volts from the power house to the transmitting house. The high tension current is generated by Thury dynamos, connected in series, and is used for charging accumulators. As a large factor of safety was required, the Marconi Company specified that before delivery the cables were to be tested between core and core, and cores and lead with a current of 56,000 (R.M.S.) volts. Not only did Messrs. Henley's agree readily to this, but they subjected the cable to the very high test pressure of 130,000 (R.M.S.) volts for ten minutes without the cable breaking down. This high voltage was reached by gradually increasing the pressure, as enumerated below, without any interval between the tests to allow the cable to recover.

TESTS

75,000	(R.M.S.) volts for	5	minutes
90,000	" "	5	"
100,000	" "	20	"
115,000	" "	30	"
130,000	" "	10	"

To make the conditions as severe as possible, the cable was bent at a radius of 17 inches in two places during the progress of the tests.—The Electrician, Dec. 10.

Recent Trade Publications

Jeffrey Mine Locomotives—Bulletin No. 17. A descriptive catalogue dealing with the various types of mine locomotives built by the Jeffrey Manufacturing Company, Columbus, O. The catalogue is exceedingly well illustrated and presents various phases of mining work in which these locomotives are of inestimable practical value in the process of modern mining operations.

Electro-Magnetic Clutches—A short illustrated catalogue issued by Cecil E. Lugard & Company, Field's Buildings, Middlesborough. Among the advantages claimed for this clutch are instant stoppage of the mill from any desired point, no time lost waiting for flywheel to expend its energy, and automatic safety device against overload. Made in either reversing or non-reversing styles.

Canadian General Electric Company, Toronto, has just issued small bulletin Nos. 112, 113, 114 and 115, entitled "Conduit Talk," dealing with the advantages and attractiveness of this form of electric wiring. Also a short descriptive catalogue on their improved electric iron Calorite; another describing their labor saving Radiant Toaster; a small blotter on which they set forth a number of good reasons for the general use of their enclosed fuse devices, and an illustrated pamphlet explaining their Kinsman portable arc lamp.

Oxyhydric Process for the casting and welding of metals by the American Oxyhydric Company, of Milwaukee, Wis. The almost incredible cutting power of this flame is illustrated by such pictures as "the cutting of a 9-inch nickel chrome plate at the rate of 2¼ minutes per linear foot." A number of illustrations are also given, showing their process of welding by the fusion of the metals.

Westinghouse Diary for 1910—Similar in character to the Westinghouse issue of previous years, which many patrons have found to contain hints of great value. The 1910 copy, however, contains much new matter and will be a welcome vest-pocket companion to the average electrician.

Electric Fixtures and Shades—A supply catalogue issued by the Canadian General Electric Company, Toronto, containing 18 pages of well illustrated information for those interested in the most recent productions in this phase of electric work. Prices given in all cases.

Polyphase Induction Motors—A revised bulletin, No. 301, issued by the Allis-Chalmers-Bullock Company, describing their various types of induction motors and the accessory parts. The general construction design of the motors is explained and the advantages of induction motors in general set forth. Well illustrated.

The Duncan Electrical Company, Limited, 86 Grey Nun Street, Montreal, have issued with the new year a neat and attractive catalogue covering their different Duncan electrical specialties. The booklet consists of 53 pages on plate paper, and the illustrations, made from photographs, form the feature of the catalogue and show to advantage the details of the various specialties the company manufactures. An introductory paragraph reviews the progress made by the Duncan Company since first their goods were introduced to the supply market five years ago. They have recently made extensive alterations and additions to their plant, and state that they are now in a position to keep abreast of the demand for their goods. This catalogue is one that dealers in sockets, rosettes, receptacles of all kinds, etc., will find extremely useful for reference. For the venefit of thir customers throughout the Province of Quebec, a French edition of the catalogue has also been published. A copy can be obtained by writing the company and mentioning the "Canadian Electrical News."

Modern Production of Power—An appeal to the reason of power producers showing why they should use a Crossley Gas Engine & Producer Plant—Issued by Chapman & Walker, Canadian agents. This firm has made a special study of Canadian conditions and requirements, and as a result are placing on the Canadian market a British gas producer specially designed for Canadian needs. A page of questions and answers presents the case for gas producer engines in a very complete form.

Book Reviews

The Shotfirer's Guide—A practical manual on blasting and the prevention of blasting accidents—Wm. Maurice, president of the Institution of Mining Electrical Engineers—"The Electrician Printing & Publishing Company, London, Eng., publishers. This book is, as its title implies, one of instruction for the use of miners, colliery officials, quarry managers, and all persons who are interested, practically or otherwise, in the safe use of explosives. The work is simply written and easily understood, the interpretation of the text being facilitated by nearly 80 illustrations, many of which have been specially prepared

Practical Testing of Electrical Machines—by Leonard Oulton, A.M.I.E.E., and Norman J. Wilson, M.I.E.E.—Whittaker & Company, publishers, London. Price, 4s.6d. A work written with the object of placing before engineers and students in pocket book form, the various tests that are taken on different types of electrical machinery.

Les Industries de l'Electricite au Canada—par Julien Dalemont, 'Electrical Engineer, Agrege of Freibourg University, M.Sc. of McGill University—A comprehensive review by this well known author of the present condition and the future possibilities of the electrical industry in Canada. Prof. Dalemont introduces his review with that now famous sentence of Sir Wilfrid's: "Le vingtieme siecle sera le siecle du Canada comme le dix-neuvieme a ete celui des Etats Unis," but has reason later to state that the United States is responsible for 90 per cent. of the machinery imported into Canada and that, in spite of the heavy duties. The work is summarized under the following heads: The Development of Canada: What is to be Thought of it; Characteristics of Chartered Companies; The United States Supply Canada with Electrical Machines; Reasons for Their Success in this Trade; Development and Present Condition of Hydro-Electric Plants; The Difficulties of Working Them; Distribution of Electric Energy for Light and Power; Results from the Working of City Street Railways.

Current News and Notes

Belleville, Ont.

A bylaw was voted on at Belleville, to confirm an agreement between the city and the Trenton Electric & Water Power Company for a franchise to light the city for three or five years. This was carried by a majority of 191.

Berlin, Ont.

Berlin voted in favor of a commission to govern the street railway.

Brantford, Ont.

The Street Railway Company are putting new iron poles in place of the wooden ones on Colborne street.

A new system of collecting fares is being tried on the Brantford street railway. Small metal discs about the size of a ten cent piece with a small hole in the centre will be used in place of tickets. Six of these will be sold for 25 cents. Similar discs of different metal will be sold to working men eight for 25 cents, to be used between the hours of 6-8, 12-2, and 5-7.

Application has been made to the Council by T. R. Varding, of Buffalo, N.Y., for a franchise to construct and operate an electric railway in the township of Brantford.

By its new agreement with the Western Counties Power Company the city in 1909, as compared with 1908, saved $1,800 on street lighting, despite the fact that 17 additional lights are in use. The rate was reduced from $55 to $48 per year. A reduction of 7 per cent. was also secured in house lighting.

Barrie, Ont.

Official notice has been given that application will be made at the coming session of the Ontario Legislature, for an act to incorporate the Monarch Railway Company with power to construct a line of railway, operated by steam or electricity, from the city of Toronto, through the counties of York, Simcoe and Grey, with terminus in the town of Wiarton. It is said that Mr. Simon Dyment is a very much interested party in this new company.

Brampton, Ont.

The ratepayers have approved a by-law to raise $40,000 for a distribution plant.

Bridgeburg, Ont.

The ratepayers have passed a by-law granting to the Canadian Niagara Power Company the privilege of bringing electric energy into the town.

Brandon, Man.

The Brandon Electric Light & Power Company through its manager, Mr. G. A. Faterson, has purchased a large quantity of new machinery for increasing the capacity of the power plants. The water power on the Little Saskatchewan river is being doubled and the city steam plant increased by the addition of two generators of 500 horse power each and a steam turbine of 1,500 horse power capacity.

The C. P. R. is gradually getting its telephone system installed. The systems between Winnipeg and Brandon, and between Fort William and Cartier, Ont., which have been in operation for several weeks, have been pronounced by the officials a great success. The telephone dispatcher's system has already been worked over the telegraph wires between Wininpeg and Fort William, but in the spring the company will install special telephone wires over these 426 miles, making a total of 1,044 miles of telephone lines in operation. The train hands carry a long pole with which connection can be made at any point en route, with the telephone wires by simply placing it against the lines.

Chingnacousy.

The municipal telephone system was the only issue in the contest in Chingnacousy Township, and the people have endorsed the action of the council in incurring an expenditure of $20,000 to provide a rural telephone system.

Campbellford, Ont.

The Northumberland Pulp & Paper Company, Campbellford, Ont., will install a log conveyor, with direct electric drive at their mill. Smith, Kerry & Chace, Toronto, have charge of the work.

Campbellford voted by 200 majority for an electric light and waterworks commission.

Cobalt, Ont.

The High Falls Power Company, of Cobalt, Ont., has issued a circular offering to supply the town with electric light at rates considerably less than those now charged. The company will shortly be in a position to supply this power.

The Mines Power Company, Limited, which is constructing a power plant on the Matabitchouan River, expects to be able to supply electricity in Cobalt in the near future. The substations at Cobalt and Brady Lake—the latter about 20, the former about 25 miles from the generating station—are about completed and the equipment nearly ready. It is proposed to erect a third substation at South Lorraine, 10 miles from the generators, in the near future. This latter station to be equipped with four 300 kw. transformers, three of which will be installed initially. The generating equipment consists of four 1,500 kw. machines.

Calgary, Alta.

It is stated that the Calgary Street Railway Company will build an extension of about 12 miles during 1910. Thos. H. McCauley, general manager.

City Engineer Child, in a recent report to the commissioners, pointed out the advisability of establishing a new power plant without delay, and suggests a site in Victoria Park as suitable.

The city of Calgary is at present supplied with power and light partly by a private company having a low head hydro-electric development on the Bow river supplemented by a steam plant, and partly by a municipal steam plant. Two propositions looking to an increase in the available power have been submitted to the city council. One is an offer of a company boring in the locality for natural gas, to supply 1,000 horse power, and the other from a company that proposes installing a hydro-electric plant on the Bow river some distance from Calgary.

Cranbrook, B.C.

The Kootenay Telephones, Limited, this place, is considering the advisability of building a line to Grande Prairie.

Telephone connection has been completed between the Alberta government system and the Kootenay telephone lines system, by which converastions can be carried on between Cranbrook and almost any point in Alberta. The Alberta government is now engaged in putting in a special metallic circuit over its main trunk lines to be used exclusively for the new connection.

Chatham, Ont.

The Board of Railway Commissioners has authorized the Chatham, Wallaceburg & Lake Erie Railway Company to construct and operate a branch line on several streets in this city.

Dundas, Ont.

The by-law authorizing a contract with the Hydro-Electric Commission was carried at the recent elections.

Dunnville, Ont.

An electric railway will probably be built connecting Niagara Falls through Allanburg and Welland, with Dunnville. Total length of road, about 50 miles. The company to be called the Niagara Falls, Welland and Dunnville Electric Railway Company. J. Carlton Gardner, of Niagara Falls, Ont., is consulting engineer.

Edmonton, Alta.

Plans have been prepared by Superintendent Taylor, for a new car barn to hold 100 cars. Only half of the building will be erected this year.

It is stated that C. H. Colgrove, M.E., hydraulic expert, has decided on a point on the Saskatchewan river about 110 miles from here as the source of power for this city. Minimum power estimated at 20,000 horse power. The proposition is now being investigated by a group of hydraulic engineers.

We are advised by Mr. A. J. Richards, superintendent of telephones for Alberta, that a recent report that the Alberta Government contemplated making extensions to their telephone system looking to connections with Vancouver, B.C., is entirely in error.

Fort Frances, Ont.

The result on the plebiscite regarding municipal ownership of telephones was 75 for and 11 against.

The Minnesota & Ontario Power Company has practically completed its initial installation and will have ready for immediate use about 2,000 horse power.

Fort William, Ont.

The following bylaws were carried: $21,000 to extend telephone system; $14,000 to extend electric system; $137,000 to further extend steel railway; $6,000 to purchase Bell Telephone.

Fernie, B.C.

This town claims to have the most economical electric light service in the Province. The rates decreased from 12.6 cents per kw. with 10 per cent. discount down to 9.5 cents per kw. with 30 per cent discount.

In the course of the next few months the second unit of the city's hydro-electric power plant will be ready for operation. The installation is at Bonnington Falls—10 miles from the city—and is in charge of R. A. Brown, city electrician.

Glace Bay, N.S.

Signor Marconi will personally supervise a new installation of his transatlantic wireless apparatus at Glace Bay in place of that destroyed by fire. The station at Clifden, on the Irish coast, has been re-equipped, and Marconi is confidently looking forward to a resumption of the transatlantic wireless service in the course of the next month.

Glen Ewan, Sask.

The Glen Ewan Telephone Company, of Glen Ewan, Sask., has been incorporated to construct a rural telephone system at this place. The incorporators are all local men.

Guelph, Ont.

W. A. Bugg, secretary of the People's Railway Company, reports very rapid progress in his railway scheme and especially from a financial standpoint. It is proposed to open an office in Guelph in the near future.

Hamitlon, Ont.

The Hamilton Street Railway Company will appeal the order of the Ontario Railway Board, compelling the railway company to pay cost of pavement for two feet on the outside of its track, and to keep this space in repair. The amount involved is about $4,000.

The Hamilton Street Railway Company have placed an order with the Ottawa Car Company for nine double-truck cars to be ready by June 1st.

The Dominion Power & Transmission Company have passed three dividends, totalling $339,000, which would not indicate any unfair earning capacity on the part of that company, but rather suggests a desire to keep the various properties in such a state of efficiency as will best serve the public.

Harrietsville, Ont.

The annual statement for the year 1909 shows the following figures: Capital stock (10-dollar shares) $9,480.00; gross revenue, $4,273; net revenue, $1,478; dividends paid 6 per cent.,; transfered to revenue, $290; balance forward, $749; total telephones installed, 313; total miles of pole line, 1,107; total miles metallic circuit, 165; connections with over 2,000 independent telephone subscribers.

Ingersoll, Ont.

It has now been decided to submit the valuation of the private plant to the arbitration of two skilled engineers.

The by-law to raise $30,000 for the erection of an electrical ditsribution plant was defeated by the ratepayers.

When Niagara power reaches Ingersoll in June the town will be under an obligation for payment of 500 h. p., whether used or not. So far practically no progress has been made as both power bylaws recently submitted to the people were defeated.

Kamlops, B.C.

Lighting rates were reduced during 1909 from 20 to 18 cents per kw. hour, without any corresponding reduction in revenue.

This city has made improvements in its lighting system and increased its capacity by the addition of a new 200 kw. generator.

Kenora, Ont.

The arbitration proceedings to determine what sum the town of Kenora shall pay the Hudson's Bay Company and the Kewatin Power Company for water rights on Winnipeg river expropriated, are proving very expensive and may be long drawn out.

Lethbridge, Alta.

The old municipal power plant at Lethbridge, Alta., was recently destroyed by fire. The new plant is nearly ready, however, and in the meantime power for the business section is supplied from one of the mines in the neighborhood.

London, Ont.

Hydro-electric power will be used in the London hospital for the insane, a provincial institution. It is announced that the government will let a contract for the equipment of all the buildings.

It has been taken for granted that both alternating and direct current would be distributed by the city. The power commissioners, however, are opposed to this duplication of wires and will try and supply the direct current customers in some other manner.

New tenders will be invited for the electrical equipment required at the power station. The former specifications are said to have contained too many alternative propositions. The machinery required includes transformers, motor generator set, voltage regulators, switchboards, lightning protectors, instruments, arc and incandescent street lighting system. E. J. Sifton, chief electrical engineer.

Melville, Sask.

Melville's telephone system went into operation on January 3rd.

The citizens of Melville have passed the electric light bylaw which gives Messrs. Cushing and Weira franchise, but not an exclusive one, to erect an electric light and power plant. Work will be commenced at as early a date as possible, and the plant has to be in operation by July 1st, 1910. Estimated expenditure, $30,000.

Metchosin, B.C.

Poles are already in position for the furnishing of light and power to this and the Colwood districts by the B. C. Electric Company.

Moncton, N.B.

A mass meeting of labor organizations, held recently to discuss the proposition to sell or lease the Moncton lighting plant to the Street Railway Company, did not arrive at any very definite conclusion. A majority was in favor of the municipal ownership and control.

Moose Jaw, Sask.

The power possibilities of the Moose Jaw river are being investigated by a government engineer who will make a report on the value of this river for domestic and commercial supply purposes for the town, and also on the prospects for damming and storing for hydro-electric development.

Montreal, Que.

President H. S. Holt, of the Montreal Light, Heat & Power Company, states that his company would be only too pleased to be relieved of the city street lighting which has been run at a loss to the company. The same power could be supplied to better advantage and at greater profit to merchants and private citizens.

The Montreal & Southern Counties Railway has received a supply of new cars for its electric system, as well as a powerful modern snow sweeper.

The Montreal Light, Heat & Power Company have obtained judgment against the city for $27,199 under the contract for the supply of electric power at the high level pumping station. Notwithstanding the fact that the power charged for had not been used, the city attorneys advise the committee to pay the account without reference to the contra account which the city had against the company. This contra account is for taxes, etc., and amounts to about $150,000.

The St. Louis Council has granted privileges to the Montreal Street Railway to build new lines and operate cars on the following streets: St. Lawrence, Compte, Sanguiner, Beaubien, Laurier, Saspe, Depot avenue, Bernard street, Clark street, St. Viateur. The manager, Mr. McDonald, stated that the line on St. Lawrence would be in operation within six months.

Norwich, Ont.

The power by-law was approved by the ratepayers.

Nelson, B.C.

The Nelson Street Railway Company has been organized at Nelson, B.C., to supply the city with an electric street railway system. A twenty-year franchise has been granted.

The new sub-station just completed contains four 250 kw. transformers which reduce the line pressure from 11,400 to 2,300 volts. Total cost, $6,055. The new transmission line from the sub-station to Bonnington falls cost $9,508. The installation of the third generating unit is nearly complete.

Tenders addressed to E. B. McDermid, secretary, Nelson Street Railway Company, Limited, will be received until February 1st for poles, ties, etc. Delivery is to be made on or before March 15th.

Tenders addressed to E. B. McDermid, secretary, Nelson Street Railway, will be received until February 10th for the following material, prices to be f. o. b. Nelson: 123 tons of 56-pound steel rails, 32 kegs spikes, 5½ by 9-12-inch, 600 tin plates suitable for 56-pound rails, 1 left-handed turnout, consisting of split rail switch, frog and two guard rails, with all necessary rods and sliding plates. Separate tenders may also be put in for 123 tons of 56-pound relaying rails. Time of delivery to be stated by tenderer.

Niagara Falls, Ont.

The proceeds of the bonds issued by the Niagara Falls Power Company, amounting to $404,285, are to be used on additions to the plant of its auxiliary company, the Canadian Niagara Power Company where two more 15,000 horse power generators will be installed.

The construction department of the Bell Telephone Company has recently finished the erection of over 4,000 feet of new cable from the city limits on Lundy's Lane to the fourth concession of the Township of Stamford. Another 1,000 feet was also put up on Welland avenue and Simcoe street, in the city.

Orillia, Ont.

Municipal ownership has again been dedemonstrated as a possible success by the returns of 1909 of the water, light and power plants at Orillia. The profits of the year were $7,000 after paying debentures and interests, and making a reduction in the light rates at the beginning of the year.

A proposal for an amendment to the Municipal Act to give municipalities the right to create a sinking fund out of the profits of their power plants and other public utilities, has been submitted to Hon. W. J. Hanna by Mayor Goffatt and Reeve Sanderson, of Orillia.

Ottawa, Ont.

The Marconi Company will, it is stated, establish over a score of stations at principal points throughout Canada to which messages from Great Britain can be transmitted by wireless telegraph. Thence to the less important points messages may be transmitted by telephone. In various portions of Great Britain, notably in the north of Scotland, the telephone has been used for the transmission of telegrams to dis-

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tant points with great success. It is understood that this new system will be in operation by early spring.

The railway board has decided that the telegraph companies should not put its five letter code limitations into effect until July 1st.

Application is being made to parliament for an act to incorporate the Monteral Kapitagewan and Rupert's Bay Railway Company, with power to construct and operate a railway and telegraph and telephone lines between Rupert's Bay and Montreal; also to acquire and utilize water power for generation of electricity.

The bill respecting the Montreal Central Terminal Company which seeks to consolidate a large number of railways, and light, heat and power companies, is held over for the present by the Dominion Parliament on the ground that it tends to create a monopoly and that the citizens of Montreal have not been consulted.

The ratepayers have approved the purchase of the Metropolitan Light & Power plant.

The Arnprior & Pontiac Electric Railway Company is stated to be organized for the purpose of building an electric railway from Campbell's Bay, Que., via Chats Falls and Graham's Bay, near Ottawa, Ont., to High Falls, 75 miles. Arthur H. Brice, Ottawa, Chief Engineer.

At Ottawa a bylaw carried, giving the Metropolitan Power Company the right to sell power in the city. This is the old company whose franchise is being renewed for sale of power only.

Application is being made to Parliament for an act to incorporate the Ottawa and Montreal Transmission Company with a capital of $500,000. The company will ask for the right to enter upon and acquire lands along and in the vicinity of the Ottawa river near Mattawa and following the Ottawa river down through the counties of Pontiac, Wright, Labelle, Argenteuil, Two Mountains, Laval and Hochelaga to Montreal, with the right to cross into the province of Ontario and to be declared for the general advantage of Canada.

The Montreal Light, Heat & Power Company applied for authority to cross with an underground cable the tracks of the C. N. R. and Montreal Terminal Railway at Tetreaultville, near Montreal. The question at issue was whether the Commisison had power to grant a provincially incorporated concern the right to cross a railway having a Dominion charter, or merely to determine the manner of such crossing, leaving some other authority to grant the privilege applied for. In granting the application Chief Commissioner Mabee held that the parliament of Canada, in passing the Railway Act, had conferred upon the Commission the powers referred to — to give rights of crossing as well as to determine the manner and method.

The plans for the development of power at the Long Sault Rapids in the St. Lawrence, at Cornwall, Ont., are now before the chief engineers of the three departments of the Dominion Government having oversight in the matter, the departments of canals, marine and public works. Elaborate plans and drawings, in detail, have been filed and they show three distinct dam proposals, each with a different elevation. The engineers will advise the government in respect to them, and the government will then decide which plan will be followed. Four power houses, three on the American side of the river and one on the Canadian side, are shown, and, roughly speaking, about 125,000 horse power is proposed at the outset. This may be largely increased. The plans will also go before the International Waterways Commission for approval.

Port Hanley, Ont.

This town will require from 100 to 150 h. p. during the summer months, which it is hoped can be obtained from St. Thomas.

Port Credit, Ont.

According to Hon. Adam Beck's statement a sub-station will be erected at Port Credit, which will have a large market in Brampton, Streetsville and New Toronto, as well as surrounding communities.

Preston, Ont.

The Canadian Westinghouse and Kilmer & Pullen, agents, General Electric Company, Sweden, McKinnon Building, Toronto, have been awarded the contract by Mr. Yeates, Hydro-Electric engineer for Niagara power distribution. These contracts to be awarded only on the condition that the money by-law to grant the $18,000 necessary is carried.

The ratepayers will be asked shortly to vote on the question of raising $18,000 by debentures for the establishment of an electric power distribution plant. H. C. Edgar, clerk.

Port Arthur, Ont.

In Port Arthur the Hydro-Electric power bylaw was carried by a majority of over 300, while the Conmee bylaw was rejected by practically the same vote.

The agreement between the city of Port Arthur and the Hydro-Electric Commission has been signed, and work on the transmission lines will begin at once.

An extension four miles in length will be built by the Port Arthur & Fort William Electric Railway during 1910. N. C. Pilcher is purchasing agent.

Welford Beaton, Seattle, is quoted as saying that a complete chain of long distance wireless telephone towers connecting the Pacific coast stations with those now doing a commercial business in cities along the Great Lakes will be erected during the coming summer in cities in Alberta, Saskatchewan and Manitoba, and in Kenora and Port Arthur.

Peterborough, Ont.

The by-law in favor of a thirty-year agreement with the Peterborough Light & Power Company was carried.

The Canadian General Electric Company are in the market for the supply of large steel castings far dynamos.

Prince Rupert, B.C.

It is reported that a syndicate backed by London and New York capital is contemplating an expenditure of about $5,000,000 in Prince Rupert, which will include the installation of electric lighting and street railway systems, and the erection of a smelter for the treatment of ores of the mining districts of the north and other industries. The project includes a steamship service to points between Prince Rupert and Portland Canal.

The work of the telephone committee is progressing favorably. Definite word has been received from the government giving the required permisison to erect poles on the streets and use them as far as is necessary. The committee has been steadily acquiring data and feel satisfied that they can get an up-to-date plant established in Prince Rupert, in the very near future. C. C. Westenhaver, who is now in Vancouver, and who is also one of the committee, will close for the equipment, which may be expected to arrive as speedily as it is possible to get it here. The local company is capitalized at $25,000, of which $10,000 will be spent at once.

The provincial government has declined to advance $75,000 for the installation of an electric light plant and equipment for this city.

A citizens' meeting held on the 6th inst., appointed a committee, consisting of Thos. Dunn, Alfred Carss and others, to employ an engineer to value the plant of the British Columbia Tie & Timber Company, and advise as to the best way and means of establishing a permanent lighting system.

The Board of Trade is agitating the installation of a civic lighting plant. It is not expected that anything will be accomplished as it is probable that the Columbia Tie & Timber Company's sawmill at Seal Harbor will be rebuilt and a larger electric lighting plant installed in connection with it.

Prince Albert, Sask.

It is reported that the provincial government will spend about $20,000 on the telephone plant. The wires in the business section will be put underground, and if a suitable site can be procured, a new building will be erected.

The farmers in the Colleston district, north of here, have decided upon a rural telephone system, work on which will be started early in the spring. George Reid, who is in charge of the system, can be addressed at Collaston, P. O., Prince Albert, Sask.

Quebec, Que.

It is reported that the Quebec Railway. Heat, Light & Power Company will soon place contracts for the construction of a sub-station at Ste. Anne de Beaupre. The company has submitted a proposition to the council of Montcalmville for the extension of its tracks from the boundary of the city of Quebec through the municipality to Cape Rouge and St. Foye Church.

Red Deer, Alta.

Negotiations are under way between the town officials and the Western General Electric Company with a view of purchasing the electric plant of the company.

Revelstoke, B.C.

The ratepayers of Revelstoke voted in favor of installing a municipal electric light and power plant.

The city will supply the C. P. R. Company with from 75 to 150 horse power of electric energy at the rate of 2 1-4 cents per kw. hour. The contract is for five years dating from May 1st. The city anticipates a revenue of at least $7,000 from this source.

The plans of the B. C. Electric Company now call for the sub-station, which was to have been built at Sardis, to be erected here of cement concrete, four storeys in height. In addition to this a building will be erected for the chief of the power house. Estimated expenditure, $80,000. Superintendent, Mr. Purvis.

Authority has been given by the council for the signing of the contract with W. Nowman & Company for the new power dam and gatehouse to be constructed.

Regina, Sask.

The city invites negotiations with capitalists and others, for the purpose of obtaining proposals for a special franchise for street car services and gas works for the city, subject to the right of the city to take over the undertaking at the expiration of a definite term of years, at a price to be fixed by arbitration. Angus Smith, City Engineer.

The council has decided to advertise that the city is prepared to consider proposals

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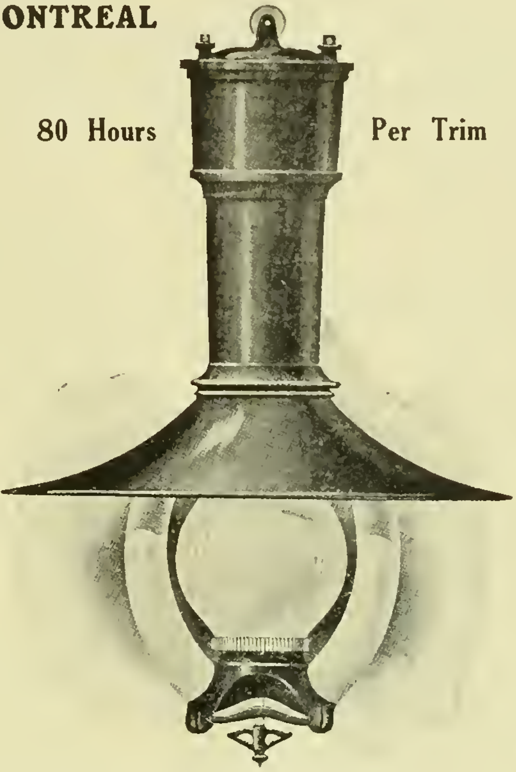

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relative to the granting of franchises for the operation of street railway and gas works, subject to the right of the city to take over the undertakings at the expiration of a definite term of years at a realization to be fixed by arbitration and subject to conditions with regard to charges to be made by the company's outsanding franchises.

At the first meeting of the new city council a letter as read from solicitors representing local parties who stated that they were prepared through the Western Trust Company, of Winnipeg, and in conjunction with J. D. McArthur, to install a street railway in this city.

St. Catharines, Ont.

At the last meeting of the directors of the Dunnville, Wellandport and Beamsville Electric Railway it was decided that connection with St. Catharines must be a part of the programme.

Summerland, B.C.

The result of the vote on the telephone bylaw was overwhelmingly in its favor in the three municipalities interested — Summerland, Penticton and Peachland — the vote being 177 for to 6 against.

Stratford, Ont.

The bylaw to create a light and heat commission was carried by the small majority of 62.

Stratford's first light and heat commission will be composed of Messrs. Angus McDonald and J. J. Mason, with Mayor Dingman as an ex-officio member.

At Stratford, a bylaw for $105,800 to buy out the electric light plant of the Stratford Gas Company was defeated.

The Water Commissioners have awarded the contract for the pumping plant consisting of domestic and fire pumps and motors to the Lancashire Dynamo & Motor Company, Limited.

Smith Falls, Ont.

At Smith's Falls, a money bylaw carried by a big majority, voting $16,000 to purchase a water power adjoining the town.

Selkirk, Man.

The town of Selkirk is contemplating taking over the electric light plant now owned by the Selkirk Electric Light and Power Company, to be operated as a municipal plant. W. E. Skinner, of Winnipeg, has been engaged to place a valuation on the plant.

St. Thomas, Ont.

At the inaugural meeting of the city council a new standing committee was named, with Alderman Price at the head, to take charge of all light and power matters, including the receiving and distribution of Niagara power and the management of the gas and light plant.

The M. C. R. has asked St. Thomas for figures at which they will supply 450 h.p. when the current is received from Niagara. A roundhouse and shops will probably be located here.

The ratepayers defeated a by-law to raise $25,000 for street railway improvements.

St. John, N.B.

Mr. J. Norman Winslow, who was appointed by the provincial government to investigate and report on the amount of security which the Grand Falls Power Company must give before proceeding to expropriate property required by them at the falls, has named $300,000, based on the calculation that these falls would produce 38,000 horse power. It is understood that the Grand Falls Power Company are completing their financial arrangements and will be in a position to proceed with construction shortly. It is contemplated to install four units of 10,000 horse power each, but development work is planned for an ultimate capacity of 80,000 horse power. This will require a considerable storage. The company is composed of American capitalists, and there have been rumors that it is proposed to transmit power across the international boundary line to operate mills in Maine. A Canadian company, owned largely by Sir Wm. Van Horne, own certain leases which the new company wishes to expropriate.

The committee appointed to investigate the telephone rates charged by the New Brunswick Telephone Company expresses the opinion that St. John city is being charged exceptionally high rates to meet deficits incurred in other parts of the company's system. The committee suggests that the Supreme Court judge be given power to regulate the rates.

An independent commission, modelled after the Dominion Railway Commission, to have supervision and exercise control over all public utility corporations doing business in this province, is being advocated by certain of the press in preference to control by the Lieutenant-Governor in council.

The electrification of the National Transcontinental Railway, from Moncton to the boundary, with power to be developed at Grand Falls on the St. John river, is being urged on the ground of preservation of the New Brunswick forests. The length of the railway line would be about 260 miles.

Included in the estimate of expenditures on account of the Light Department for 1910 is an item of $23,500 for 314 arc lamps at $75, while large amounts will be spent by the Fire Department on hydrants, hose and fire alarm supplies generally.

Saskatoon, Sask.

The new telegraph line of the Canadian Northern Railway Company into Saskatoon was placed in commission on December 20. This town now, for the first time in its history, has telegraph competition.

Toronto, Ont.

Another step has been taken by the Hydro-Electric Commission which will have a direct beneficial influence on the municipalities of Ontario. It has been decided that a uniform system of accounting for all municipalities, especially those having dealings with the Hydro-Electric Commission, should be in use, and with that end in view a committee has been appointed to draw up the system. The gentlemen who will form the committee are, A. C. Neff, of Guelph; J. W. Scully, of Berlin; R. R. Sweeny, of Toronto; F. G. Jewel, of London; Mr. Sharpe, the provincial municipal auditor, and Mr. Andrews, auditor for the Hydro-Electric Commission.

Gross earnings of Toronto Street Railway Company in 1909 totalled $3,903,257. The city's percentage amounted to $507,827.

The Factory Products Company have been awarded contracts for the following supplies in connection with the municipal electrical distribution plant: 30-foot poles at $2.35 each; 35-foot poles at $3.90 each; 40-foot, at $5.25 each; 45-foot, at $6.50 each; 50-foot, at $9.00 each; 65-foot, at $11 each; crossarms, $2,462; braces, $2,527; guy wire, $347. The Northern Electric & Manufacturing Company were given a contract for machine bolts at $1,493, while an order was placed with Brazil & Company for 45-foot poles at $6.50, 50-foot poles at $9.00, and 60-foot poles at $14.

The Legislation and Reception Committee has recommended the city council to apply for legislation at the next session of the provincial parliament to amend the Hydro-Electric Act or Municipal Light and Heat Act, so that the city can make contracts for light and power for ten years or more.

The G. T. R. is preparing to operate part of its Ontario system by telephone, as is now done on several divisions of the C. P. R. with considerable success and economy. Work is to begin at once on the stringing of a telephone line along the road from Toronto to North Bay, and later on another telephone installation will be put in between Allandale and Hamilton.

Mayor Geary hopes to have the municipal light and power system in operation before 1911. He also suggests application to the legislature for power to construct and operate tubes for underground railway purposes.

The Norton Telephone Company is to be liquidated with Mr. E. R. C. Clarkson as liquidator. W. Stavely was the applicant for the appointment of a liquidator.

The Bell Telephone Company will erect a new north exchange, with a regulation ten thousand unit board, to take the place of the present Hayden street exchange, as soon as the spring weather permits. A suitable site has been bought on Bismarck street, about 160 feet east of Yonge street.

At a recent meeting of the directors of the St. Lawrence Power Company, Limited, (which company is operating the power plant at Cornwall, and are applicants for the development of more power in the Long Sault Rapids, opposite Cornwall), Mr. F. H. McGuigan, of Toronto, formerly first vice-president of the G. T. R., was elected president, Mr. Geo. G. Foster, K.C., vice-president. Mr. Leighton McCarthy, K.C., was also added to the board.

Tenders are wanted for approximately $8,000 kw. of 13,800 volt transformers. For information apply at once to Electrical Department, City Hall.

Tenders addressed to G. R. Geary, Chairman, Board of Control, will be received until February 8th for the construction of feeder conduit runs and manhole at the terminal station. Specifications at the Electrical Department, City Hall.

Preparations are being made by the G. T. R. Company to install a telephone system on a portion of the Northern division, which will be used as an auxiliary to the present telegraph service.

Vernon, B.C.

The council have endorsed the scheme for an electric railroad, the supplying of power and light, which Mr. E. G. Warren, representative of the Couteau Power Company, presented. Involved expenditure, $2,000,000.

The Shuswap Light & Power Company has offered to purchase the Armstrong municipal plant and reduce the price of light in the entire valley from Sicamous to Penticton. A price of 10 cents per kw. is proposed, the present rate being sixteen cents.

Victoria, B.C.

The contract system will be followed by the city in carrying out the scheme for a system of ornamental lights which are to be erected on Douglas street between Humbolt and Cormorant, and on Yates street between Douglas and Blanchard streets.

The B. C. Electric Railway Company has taken option on Douglas street property

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lying between Discovery and Chatham streets, to be used as site for terminals. Messrs. Grant & Lineham put through the deal.

The B. C. Electric Railway Company, Limited, called some time ago for competitive plans for a new building for their head offices there, and fourteen architects submitted plans and drawings. Of this number those filed by Mr. Griffiths have been awarded first place by the judges, and the first prize of $500 has been given him.

The Hinton Electric Company, of Victoria, B.C., has been awarded the contract for the installation of fire alarm systems and bells in all the public schools of the city.

The application of the Burrard Power Company for the right to erect a dam at the lower end of Lillooet Lake in the railway belt, for the purpose of raising the water in the lake, and diverting it to a power house to be erected about four miles down the Lillooet River from the lower end of the lake, has been approved by the executive council at Ottawa. The minimum amount of expenditure to be made in connection with the works annually during the five year agreement is $25,000, and the water power to be developed 3,000 horse-power.

The British Columbia telephone cable connecting Vancouver island with the mainland was repaired after an interruption in service of thirteen days. A second cable is needed and the question of its installation will, it is understood, be taken up in the near future.

Vancouver, B.C.

The B. C. Electric Company's business showed an increase in 1909 of 13 per cent. over 1908.

Immediately after the break down of the plant of the Winnipeg Electric Company, which supplies Winnipeg with light and power, the British Columbia Electric Company decided to build an auxiliary plant in the vicinity of Vancouver, B. C. The company has voted $6,000,000 for this and other work in Vancouver this year. Any inquiry should be addressed to R. H. Sperling, general manager, Vancouver.

It is understood that the local management of the British Columbia Electric Railway Company have practically arranged for the construction of the auxiliary steam plant, to cost between $250,000 and $300,000.

The police department of the city administration will ask another $10,000 appropriation for the purpose of completing the police patrol system throughout the south side of the city. This will bring the total cost of the installation to $28,000.

The B. C. Telephone Company is removing poles from certain streets and placing the wires underground. It is said the appearance of the streets is being materially improved.

Vancouver on January 13th voted to grant a franchise to a competing telephone company by a majority of about three to one. It is probable that this system, if installed, will use the automatic central exchange system.

The proposed additional development by the Vancouver Power Company, at Coquitlam Lake, provides for an earth and rock filled dam of sufficient height to raise the water level of the lake 60 feet. The total capital investment, $18,000,000 at present, will be increased to $26,000,000 within two years.

At a recent meeting of the B. C. E. R. managers the car building programme for 1910 was mapped out. It calls for five powerful locomotives and 100 freight cars and 38 double truck cars of the latest type, as well as additional equipment for Victoria, etc. Estimate outlay, $500,000. Approval of the London board received. Contracts for the part of the equipment not supplied by the New Westminster shops, will be called for.

It is reported that the British Columbia Electric Railway Company has placed an order with the Allis-Chalmers Company, Milwaukee, Wis., for equipment for steam turbo-generator units which will be used in connection with extension of the service.

Winchester, Ont.

The present street lamps are being replaced by 60-watt tungsten lamps. Thomas C. Van Bridger, local manager.

Windsor, Ont.

The Pere Marquette Railway Company has closed a contract to equip four of its car ferries with the wireless telegraph.

Waterous, Sask.

It is reported that application has been filed for a franchise to operate an electric light plant, by Messrs. Francis Cushing and W. Arthur Wier.

Waterloo, Ont.

Tenders will be called shortly for electrical equipment for the proposed municipal electric plant. Contracts for the construction of the power house have been awarded. Geo. Grosz, this place, is engineer; Ford S. Kumpf is secretary of the light commission.

Welland, Ont.

The Niagara, St. Catharines and Toronto Railway Company has completed the excavation for the new power house and tenders for the building are being asked for.

Woodstock, Ont.

The electric light system showed a net profit for the year 1909 of $6,122.29. Total debentures outstanding, $73,218.27. Sinking fund, $15,960.00. The rates for lighting are 8 cents per kw. hour with free renewals. Power rates vary from 6 cents down to 3 cents per kw. hour, depending on quantity taken. During the nine years the system has been under municipal control the number of incandescent lamps has increased from 600 to 9,700, and the street and commercial arc lamps from 70 to 173.

Winnipeg, Man.

The gas, light and parks bylaws were defeated by the electors of St. Boniface.

In accordance with recommendation made some time ago by Prof. Herdt, the Winnipeg Street Railway Company will construct a conduit for the return wires of their system in the sections most affected by electrolysis. The conduit will be about 3 feet underground.

Tenders addressed to the Chairman of the Board of Control will be received by M. Peterson, Secretary, until February 15 for the supply and erection of various portions of the equipment for the terminal station at Winnipeg and for the turbine governors and gate valves for the generating station. Plans, etc., at office of Smith, Kerry & Chace, Confederation Life Building, Toronto, and these may also be obtained at the Engineer's office, Carnegie Library Building, this place.

The plans for the new North End Telephone Exchange are under way. Work will not be started until spring.

In the installation of the municipal lighting and power plant, Prof. L. A. Herdt, of Montreal, has associated with him W. Kennedy, jr., and Prof. Ruttan, of Montreal, Que. Estimated expenditure, $2,000,000.

The contract for the construction of the terminal power station at Point Douglas is to be let at once. The building will stand aproximately on 60 feet by 100 feet, two storeys in height and of brick with stone foundation. Estimated expenditure, $308,800.

Contracts in connection with the power house right of way from Point du Bois to the city's power house have been awarded as follows: Wire fencing and gates to the Canadian Steel & Wire Company at $3,348; posts to Weatherby & Eklund at $2,298.

Nelson & Cassidy, of this city, have been awarded the contract to supply the Manitoba government with 150,000 telephone poles. Estimated expenditure, $200,000.

City Electrician Cambridge is issuing the following official notice to electrical contractors: "You are hereby notified that By-law No. 5806, prohibiting the installation of electric wiring in any manner save in iron conduits in certain districts and classes of buildings in the city of Winnipeg is now in force."

The municipal power installation at Point du Bois suffered a considerable delay in the last days of the old year, due to a break in the coffer dam. The break was repaired in a few days, however, and it is hoped the total work will be completed before schedule time.

The new sub-station of the Winnipeg Electric Company, at its north end car barns, is now in operation, and all the cars north of the subway are now supplied from that station. There are four of these substations in the city, one at the transformer plant, one on Portage avenue on the west side of the city, one on Pembina south of the river, and the new one in North Winnipeg. The sub-station on the west side operates all the cars west of Sherbrooke, and the one on Pembina operates the cars south of the Assiniboine.

During 1909 2,500 new rural subscribers were added to the list of (government) phones, making a total of nearly 10,000 farmer subscribers. Applications to the number of 3,000 have not yet been installed.

M. Peterson, secretary, Board of Control, writes that the contract for supply of wire fence and posts for fencing the power transmission line between Winnipeg and the Brokenhead river, has been awarded as follows: For wire fence and gates, The Canadian Steel & Wire Company, Winnipeg, $3,348; for cedar posts, Weatherby & Eklund, Winnipeg, at $3,399.30.

It is reported that the Winnipeg Street Railway Company have let the contract to the Babcock & Wilcox Company, Limited, of Montreal, to instal boilers sufficient to give an additional 3,000 horse power. This will cost in the neighborhood of $35,000, and will simply be maintained as a reserve.

The town of Fort Saskatchewan, Sask., has purchased the electric light and power plant from the local company, of which O. Higman was the general manager.

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Electrical News

Generation, Transmission and Application of Electricity

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EDITOR'S ANNOUNCEMENT.

Correspondence is invited upon all topics coming legitimately within the scope of this journal. Subscribers can materially assist by sending in news items and information regarding electrical development in all parts of Canada.

Vol. 19 Toronto, March, 1910 No. 3

British Conservatism

A story that has recently caused considerable and unfavorable comment in electrical circles is told of a British manufacturing house that received a small sample order from a large Canadian operating company, but refused immediate shipment and postponed the filling of the order for some three weeks until payment could be made. The story further adds that, as a result, a firm from the United States received the larger order which the purchasing company had in view.

The truth of the story is apparently beyond dispute and the circumstance arose, no doubt, either from an absolute ignorance of modern competitive business conditions, which is unlikely, or from lack of proper information as to the financial standing of the operating company in question, which, though more probable, is nevertheless quite as inexcusable. The fact is patent to the careful observer that the British manufacturer has not, until quite recently, looked upon Canada as a field for extensive operations, that he has not followed the rapid expansion of Canadian industries as our neighbors to the south have done, and, as a result, a peremptory sample order unaccompanied by the necessary draft is looked upon with more or less suspicion. We believe, however, that already this firm is an isolated exception and that the British manufacturers are now, in general, systematically informing themselves on electrical development matters in Canada. In the very recent past keen appreciation of the value of Canadian trade has manifested itself in the establishment throughout Canada of branches of many English firms, and these branches too, have shown themselves thoroughly capable of competing both in the matter of getting business and in the even more important matter of keeping it.

The advantage of proximity to the Canadian market has worked out in favor of the United States goods, too, in more ways than one. To begin with, the conditions of operation are very similar in the two countries and it follows that apparatus built to suit United States requirements must, within close limits, also meet Canadian needs. Further than that, these firms being established in the very midst of operating companies were quick to note necessary changes and improvements and to instal these in their later apparatus. Last, and for this Canadian operating companies and municipalities have themselves only to blame, the time allowed manufacturers and dealers for looking into and studying the requirements of each particular case and for submitting tenders thereon has been so very meagre that any English firm has, in the great majority of cases, been absolutely barred from participating. With the advent of the local representatives of the more distant firms and with more liberal time allowance on the part of the purchaser much better results may confidently be looked for and a keener competition be established between the manufacturers of the old and new world which will result advantageously to all concerned.

Keen Competition as Before

In presenting his annual statement of the operations of the Mackay Companies for the year 1909, Mr. Clarence H. Mackay, president, reiterates his previous statement that competition will exist as heretofore with the American Telephone & Telegraph Company, and as further evidence announces that the Mackay Companies are selling out all their holdings in the latter company. In this connection the following paragraph appears in the report:

"The Mackay Companies will sell its entire holding of stock in the American Telephone & Telegraph Company, that step being in deference to public opinion, which views with suspicion this large holding of stock in a company which has recently purchased the control of the Western Union Telegraph Company. Moreover, that stock was acquired by the Mackay Companies with a view to bringing about economies in the construction and maintenance of joint pole lines over long stretches of country, where the business was not sufficient to justify either company constructing an independent pole line by itself. Many such arrangements were made, each company owning one-half of the pole line, but having nothing to do with the business of the other company. Since, however, the American Telephone & Telegraph Company has acquired control of the Western Union Telegraph Company, the time has come for the Mackay Companies to sell its holdings of stock in the American Telephone & Telegraph Company, and that will be done."

Canadian Telephone Conditions

Mr. Francis Dagger, secretary-treasurer of the Canadian Independent Telephone Association, has issued a small folder outlining the aims of the Association and pointing out wherein such an organization can be of great value in assisting new organizations as well as in helping to solve the problems of the older companies. To quote from the pamphlet: "The Canadian Independent Telephone Association exists for no other purpose than to protect the interests of its members and assist in the development of telephone systems to be owned and controlled by the people in the localities where they are established."

It is apparent that increasing interest is attaching to the subject of telephone control, as proof of which a bill was recently introduced in the Ontario Legislature, and given its first reading, whereby the control of all telephone companies doing business in Ontario under provincial charter will be subject to the jurisdiction of the Railway and Municipal Board. This Board will have power to supervise rates, approve agreements, enforce inter-connection between two companies operating in adjacent territories, and will, in general, stand in the place of mediator between operator and subscriber.

Whether or not this legislative move is traceable directly to the Independent Association, it is certain that the bill has their willing support in as much as they see in it a means of regulating the terms of agreement by which many of the smaller municipal companies are almost daily becoming entangled with the Bell system. It is claimed that in the matter of terms the innocent independents are no match for the arch enemy, and that the result has been in a large number of cases not only that the smaller company loses its identity but that rural extensions have been absolutely blocked. There does not appear to be any reason to doubt that competition, within certain limits, in the telephone business, as in others, will mean increased efficiency of service. Even without competition there is ample room for rural extensions, and any scheme which seeks to unify these isolated units, either for the bettering of telephone service or for the strengthening of the system against undue influence from monopolies, deserves the support of the whole body of legislators.

The United States Tariff Changes

The tariff situation in the United States is doubtless being pretty closely followed by Canadians, but, briefly stated, is as follows: The United States Government will hereafter impose on imports from all countries that are thought to be making any undue discrimination against United States products, an additional tax of 25 per cent., ad valorem. On March 31, President Taft will issue his blacklist, and it is just possible Canada may be included.

So far as electrical goods are concerned, it is probably sufficient to point out that our exports south for the eight months ending November 30, 1909, only amounted to about $17,000, so that, under the proposed regulations, Canadians would be out only $4,000 The imports from the States, however, for the same period nearly reached $2,000,000, which, on the assumption that the Canadian tariff would be adjusted to meet the new conditions, would yield the comfortable revenue of about half a million dollars. It does not appear that the Canadian manufacturer has much to fear from the threatened change.

Steady Progress of Toronto Electric Light

The annual statement of the Toronto Electric Light Company, presented by its president, Sir Henry M. Pellatt, shows gross earnings for the year 1909, $1,292,545, as compared with $1,155,582 in 1908; and net earnings of $530,707, as compared with $439,254 the previous year. In spite of extensions and the increased complexity of the company's operations, the operating expenses have been reduced nearly 3 per cent. The task of remodelling the rates, necessary on account of the varied and extended uses to which electricity is nowadays applied, is also, the president states, being undertaken.

The operations of the Toronto Electric Light Company have been marked throughout the years since its inception in 1884 by uninterrupted yearly advances, not only in the quality of the service rendered but also by the volume of business undertaken and of gross earnings received. In the last ten years, for example, gross earnings have almost quadrupled, having increased from $352,000 in 1899, to $1,292,545 during last year.

For many years, however, no dividends were paid, and, indeed, at no time have the directors of the company shown any inclination to declare more than a fair dividend return, and in consequence quite large sums have yearly been available for renewals and extensions to the plant; as a result the company's system has been prepared at all times to render efficient service, and is apparently to-day in the highest state of efficiency.

The president stated his belief that the company under the new management, would in the future be even more successful than in the past and that there was no occasion to fear competition from the projected municipal enterprises.

Toronto Street Railway

One sentence in Manager Fleming's remarks before the shareholders at the annual meeting of the Toronto Railway Company outlines pretty accurately the conditions as they exist at the present moment:

"It will therefore be seen that all judgments have been in favor of the claims of the company, and had the city allowed the company to put down its tracks as they at first proposed after the judgment of the Privy Council, or indeed after the ordering of the Railway Board, or later still, after the decision of the Court of Appeal, by this time from 15 to 20 more miles of track would have been laid and over 100 more cars would have been at the service of the citizens."

A casual observer of the Toronto railway situation must recognize at a glance that the citizens of Toronto do not reach their homes in the evening or their offices in the morning without being subjected on occasion to considerable inconvenience. The tired travellers who suffer the inconvenience, have recourse to the same method of relieving their wounded feelings, and members, as the delivery-boy has who whips his tired horse because his fingers are cold; they lash the company. The electrical man, however, sees neither of these things, but makes a fine and judicious calculation as to relative values of apparatus and results. The electrician sees, in the Toronto Railway Company's property, one of the very finest traction equipments in America (inadequate, of course—the general manager himself admits that), with abundance of power, splendidly arranged schedules, that also are adhered to, continuity of service, rapid transit. To the electrician, once more, who is best able to judge of things as they are, the results obtained by the Toronto Street Railway Company under existing conditions indicate a rare combination of consummate skill and thoroughly efficient organization. Even as it stands to-day there is no better traction system in Canada, and if, or when, the much needed extensions are a fact, which is a consummation probably not far distant, Toronto promises to have a system as well equipped and as ably managed as any traction system on this continent.

The Kenora Arbitration Award

The board of arbitration appointed last September to place a valuation on certain properties expropriated by the town of Kenora belonging to the Hudson's Bay Company and the Keewatin Milling Company, has named $80,000 as the sum the town shall pay.

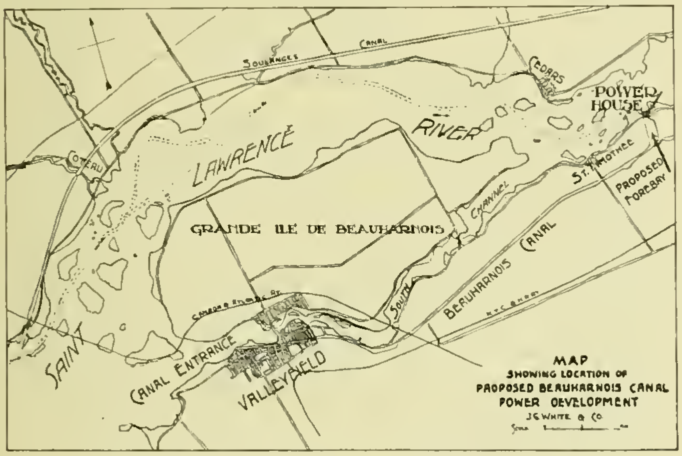
Some three years ago the town of Kenora expropriated about eleven acres of land belonging to the Hudson's Bay Company and a smaller area belonging to the Keewatin Milling Company. This land bordered on both sides of the Winnipeg river, where it was the intention of the town to establish a municipal hydro-electric generating plant to supply light and power. Since that date the terms of payment for this land have been matters of dispute, payment being offered by the town for the land only, about $2,000, while the purchase price named by the private company was based on the value as a site for hydro-electric development, and was in the neighborhood of $2,000,000. In the interval, various engineers have valued the property, the estimates ranging all the way from $20,000 to $250,000.

The fact that stands out most prominently in the whole matter is the extreme discrepancy that apparently can exist between different honest estimates of the same property, this being noticeable not only in the estimates of the parties financially interested, which perhaps is only natural, but also among the opinions submitted by experienced engineers. It would appear that in making their award the commission has chosen the fairest course, and that while the apparently too optimistic demands of the private corporations could not be entertained, neither could the commission see its way clear to ignore the rights and property values of private individuals even though such injustice would have benefitted "a municipality."

Beauharnois Canal Development

Steady progress is being made in the initial construction work for the hydro-electric power plant which is being installed by the Canadian Light & Power Company on the Beauharnois canal. The location of the power house and the general plan by which it is intended to utilize the old canal at a point near St. Timothee, Que., where it empties into the St. Lawrence river is indicated in the accompanying figure.

Work was commenced in September and already a coffer-dam 980 feet long and 20 feet wide at the top has been completed; the enclosed water amounting to eleven million gallons has been pumped out; and excavation for the power house has been carried to such a point that concreting is about to be started for the foundations of three power units. Considerable work has also been done on the intake excavation. It has been estimated that the total quantity to be excavated will amount to 250,000 cubic yards, of which about one-eighth is rock. The volume of concrete work is estimated at 32,000 cubic yards.



Canadian Light & Power Company's Plan of Electric Development.

The initial power installation will be about 20,000 h.p., which it is hoped to have in operation by Dec. 1st, 1910. The completed plans, however, call for a final capacity of 100,000 h.p.

The excavation and concrete work now under way are in charge of Mr. George W. T. Nicholson, of Montreal, who holds the complete contract, including, in addition to the work already mentioned, cleaning and grubbing of the power house site and forebay; excavation of the tail race, power house, spillway and headwall; the excavation of the intake and of a conducting canal 1,000 feet long; the building of earth embankments for a large forebay; concrete work of the power house superstructure, the head wall, the intake, and the raising of lock No. 13 on the Beauharnois canal.

Associated with Mr. Nicholson in this work are Mr. E. H. Drury, C.E., and Mr. F. N. Finlay. The engineering and supervision on behalf of the company is in the hands of Messrs. J. G. White & Company, Montreal, who are represented on the works by Mr. J. D. Evans, C.E.

A Big Development Proposition

The Long Sault Development Company, in conjunction with the St. Lawrence Power Company, propose, if their scheme is approved at Ottawa, to build a 4,500 foot dam, 45 feet high, across the St. Lawrence river at the head of the Long Sault rapids, and to build an electric plant to develop 600,000 horse power. The project is favored by the towns and municipalities in the vicinity, which hope to profit by cheap power, a figure of $15 per horse power having been quoted by the promoters of the scheme. Opposition is being raised by the Ontario Government, the Conservation Committee at Ottawa, and various other bodies, who see in the proposal a possibility of an encroachment on Canadian resources for the development of United States enterprises. It is also feared that the navigability of the river may be affected by the diversion of so great a quantity of water. The latter objection, however, is met, for the companies, by a promise to provide a new ship channel of ample proportions on the south side of the river. Apparently almost unlimited capital is behind the scheme, which is planned to cost in the neighborhood of $20,000,000.

Rapid Growth of Canada's Twin Cities

Owing to the rapid growth of the West, manufacturers and wholesalers are being attracted in large numbers and elevators are being constructed with world-record capacities. During the past three years the building growth of Fort William and Port Arthur has exceeded that of any other city in Canada of the same size, Fort William alone ranking fifth, coming next to Montreal. Among the more recent extensions may be mentioned: The Western Terminal Elevator, 1,000,000 bushels capacity, which has just commenced operations; the Ogilvie Flour Mills Company's 1,000,000 bushel elevator, just completed, and the enlargement of their flour mill capacity by 25 per cent.; and the Grand Trunk Pacific Elevator, which will be in operation by the opening of navigation. This latter elevator will have an immediate capacity of 4,000,000 bushels, and the plans call for an ultimate extension to 40,000,000 bushels.

In addition to the above, the following list indicates a number of other works either already under construction or about to be constructed: A shipbuilding plant or dry docks, to cost $1,000,000; a hotel to cost $250,000; two more elevators, each of 1,000,000 bushels capacity; a wire works and rolling mill; furniture factory; leather factory; linen mills; iron ore docks and coal docks. Further, all three transcontinental railroads, the Canadian Pacific, the Grand Trunk Pacific, and the Canadian Northern, as well as the Dominion Government, are to spend several million dollars during the current year in increasing terminal facilities.

The Kaministiquia Power Company

Although the attractive features of Canada's twin cities include such items as cheap raw materials, minerals in abundance and unusual transportation facilities both on land and water, one of the most important factors in the development of these cities lies in the abundant supply of cheap and reliable electrical power. For many years Fort William has enjoyed these advantages, and now the contract has been signed between Port Arthur and the Kaministiquia Company by which the latter will supply to Port Arthur anywhere from 5,000 to 10,000 horse power, as the demand increases. The present installation of this company is over 15,000 h.p., and in all probability another 10,000 h.p. unit will be installed in the near future to meet the rapidly growing demands of the two cities. The plant is planned for an ultimate capacity of 50,000 h.p.

Some idea of the increasing demand for power may be gathered from the fact that the Kaministiquia Company have under construction at the present time over ten miles of transmission line to supply their various customers; that their contract to operate the Western Terminal Elevator electrical installation calls for 600 h.p.; that the Ogilvie Flour Mills Company takes 2,000 h.p., and that the Grand Trunk Pacific elevator electrical requirements will be 2,400 h.p., all supplied by the Kaministiquia Power Company. The apparatus used in the Grand Trunk installation consists of Allis-Chalmers-Bullock motors, and Westinghouse switchboards, and the wiring contractors are the Federal Electric Company of Toronto.

Winnipeg's Municipal Power Plant

The work upon the city's power site at Point du Bois was begun under contract of Feb. 3rd, 1909, previous to which date the site only had been cleared and 25 miles of standard gauge railway had been built by the city to provide proper access. Fairly good progress has now been made on the canal excavation and on the construction of the concrete dams, and, since the winter has begun, the work of closing the river by means of a rock fill has been prosecuted ,and already the upper waters have been raised several feet. The natural elevation of the upper river will be raised, by the permanent works, 13 to 15 feet, giving to the total waterfall developed a head of 45 feet net, all hydraulic clauses having been considered.

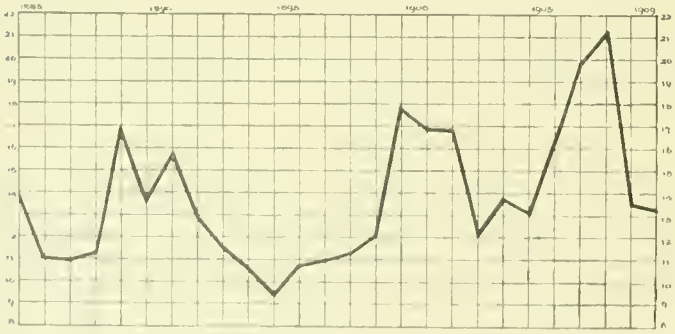
The construction of the power house has been carried on since November within a huge shed, and the concrete foundations which have been laid to date have been placed under conditions almost ideal for this work.

The contractors, who are manufacturing the equipment, are making energetic progress, and it is expected that deliveries of machinery will begin in August next.

The transmission line construction is fairly well under way. Nearly all the towers will have been delivered by the end of February. The contractors in charge of the erection of the transmission system are prosecuting their work with diligence, and this winter are engaged upon those portions of the right-of-way which cross the swamps, and other districts inaccessible in other than winter weather.

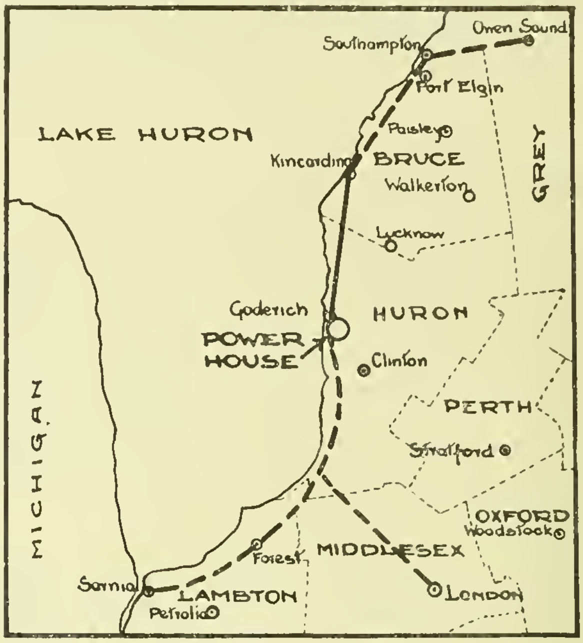
Copper Conditions

In view of the much talked of copper merger, it is interesting to note the range of prices during recent years as recorded in the accompanying sketch. The fluctuations appear to be fairly regular and periodic, though the causes may not be so. At the present time it is probable the low price of copper is due in considerable measure to the competition of aluminium, which is being used extensively in electrical work where formerly copper had a virtual monopoly. The price throughout the year 1909 varied very little and remains practically steady up to the present time.



Progress on Ontario West Shore Railway

For the past eighteen months the Ontario West Shore Railway Company have been steadily carrying forward construction work on that part of their line which will connect Goderich and Kincardine. Of this distance, the grading is completed on about 25 of the 40 miles and ties, rails, etc., are lying in Goderich in readiness for the opening of spring. Present indications are that the road will be in operation between these two points by midsummer of the present year. The roadbed is being constructed to carry the heaviest traffic, 70 pound rails are being used throughout, and it is the aim of the management to make this road, in every detail, compare favorably with the best operating roads on the continent. Further extensions in the immediate future will continue the line north and east to Southampton and Owen Sound, and south to London and Sarnia, as shown by broken lines in the accompanying sketch.



Route of Ontario West Shore Railway.

Power for the electric railway will be supplied by the Maitland Power Company, which is constructing a hydro-electric plant on the Maitland river about two miles from Goderich: Already the dam is nearing completion and contracts are let for the power house apparatus, both turbines and generators. The initial installation will consist of three 3,500 h.p. units and provision is made for a fourth unit when required. It is calculated that 15,000 h.p. can be developed at this point. The dam is 1,800 feet wide and will supply a head of about 105 feet. Power will also be supplied for lighting purposes to the town of Goderich.

This section of the Province of Ontario has hitherto been poorly served with transportation facilities, and the entrance of a road that will carry on a freight and express as well as a passenger business will be a valuable asset to the towns and municipalities along the shore of Lake Huron.

Developments at Jordan River

The Vancouver Island Power Company, of Victoria, have recently closed a contract with the Vancouver office of the John McDougall Caledonian Iron Works Company, Limited, for the supplying of the first hydro-electric unit in the immense developments they have undertaken at the Jordan river on Vancouver Island. Preliminary work in connection with the laying out of this plant at the month of the river was begun some twelve months ago, and it has been decided by the Vancouver Island Power Company, which is a subsidiary company to the British Columbia Electric Railway Company of Victoria and Vancouver, to install head works, pipe lines, power house and foundations for an ultimate development of 40,000 horse power; the first unit installed being 6,000 horse power full load capacity. The power house is situated on tide water, and the water wheels, which will be of the impulse type, are to operate under an effective head of 1,100 feet.

The contract which has just been closed with the John McDougall Caledonian Iron Works Company, Limited, covers the supplying of the main generator and water wheel unit, consisting of 4,000 k.w., three phase, 60 cycle, 2,300 volt Allis-Chalmers-Bullock generator running at 400 r.p.m., and direct connected to a 6,000 h.p. Doble impulse water wheel. The exciter unit is to be driven both by induction motor and water wheel, and consists of a 100 k.w., 130 volt special designed interpoled direct current generator ,direct coupled on one side to a 150 h.p. special 3 phase, 60 cycle ,2,200 volt induction motor, and direct connected on the other side to a 200 h.p. Doble impulse water wheel. The exciter generator and motor will be built by the Allis-Chalmers-Bullock Company, both of a special design, this being necessitated by the customers' requirements, which call for an extreme steadiness in voltage regulation. The induction motor will be designed to run very close to synchronous speed in order that any tendency of a reduction in the speed of the unit, due to overloads coming upon the motor, will permit of the water wheel taking up the excess of load and maintaining the required speed.

The main generator unit will be of the standard Allis-Chalmers-Bullock construction, with the exception of special design, which will be incorporated in the rotating element due to the high speed of operation for a unit of this size. The Doble impulse water wheel will be of a special design permitting of high water economy, and at the same time preventing sudden increases of water pressure in the pipe line. This design will be similar to the design incorporated in the 11,000 h.p. unit recently installed by the John McDougall Caledonian Iron Works Company, Limited, for the Vancouver Power Company, and which has proven so successful in its operation. The impulse wheel will be provided with a Doble patented chain type of bucket, and the water will be conducted to the wheel through a single needle nozzle fitted with needle auxiliary relief for water economy and pressure regulations.

This power house is situated some 40 miles from Victoria and will supply power to the British Columbia Electric Railway Company in Victoria at 35,000 volts, the transmission line being designed for an ultimate voltage of 60,000, to which the system will be changed upon the installation of the second unit.

Simcoe Railway and Power Company

The Severn river is capable of three large hydraulic power developments on its course to the Georgian bay. The uppermost, at Ragged rapids, a 40 foot fall, is developed to produce about 1,600 h.p., which is transmitted to Orillia. The fall at the mouth of the river is about 8 feet, and besides the series of dams for lumbering purposes, a start was made some years ago towards its hydro-electric development, and will doubtless be carried to completion as the markets for power develop. The Big Chute, intermediate between these two, is about 12 miles from the mouth of the river.

The Big Chute is the site of the largest possible power development. This natural fall is of about 52 feet and by raising the headwater and lowering the tailwater a full head of 58 feet will be obtained. This power is now being developed by the Simcoe Railway & Power Company, of Midland, and the proposition is to transmit electric power to Midland and Penetang and the intermediate points for industrial and municipal purposes.

The hydraulic arrangement of the plant consists of a concrete dam and spillway at the Chute itself; on the neck of land between the head water and tail water, about 500 feet across, the intake and canal have been cut, terminating in a forebay about 150 feet from the power house site at the edge of the tail water. Penstocks will lead down to the power house and distribute to the several turbines to which the generators will be direct connected. The turbine capacity will aggregate about 6,500 h.p. The generated power will be stepped up to 25,000 volts for transmission to Midland, about 27 miles distant, where the main receiving station will be situated. The transmission conductors will be carried on poles on an ample right of way and will entail a special crossing over the half-mile channel of Matchedash bay at Waubaushene. The work has progressed considerably this season and it is understood that the contracts for the machinery will be immediately let, the tenders having been already received.

The Simcoe Railway & Power Company is a group of Midland men who have large local interests; Mr. W. Finlayson, of Midland, is the secretary; C. H. and P. H. Mitchell, Toronto, the engineers, and Pratt & McDougall, of Midland, are the contractors for the general works and transmission line.

Cranbrook's Electric Light and Power Facilities

By the 22nd of May next the Cranbrook Electric Light Company, in accordance with the terms of a duly executed contract, must be in a position to supply the city with a specified electric horse power, or in default forfeit their deposit of $3,000. The new power house being erected for the Electric Light Company covers an area of 94 x 54 feet. It is built of solid brick, supplied by the Cranbrook Brick Company, with cement foundations and a galvanized iron roof, being as near fireproof as possible. The new building is situated on the site formerly occupied by the East Kootenay Lumber Company's sawmill, the Electric Light Company owning seven and a half acres at this point. The building is divided into two compartments, a boiler room, 44 x 51 feet, and engine room of the same size. Provision is made for coal storage bins, with a capacity of 600 tons, connected with the C.P.R. main line by a spur, so constructed as to permit of the cars unloading right into the bins.

The equipment of the new power station will be new throughout, and will consist of three boilers, with a capacity of 600 h.p., and two engines of 600 electric h.p. The boilers are now already in position and the steam equipment is being placed. This machinery was supplied by the Goldie & McCullough Company, of Galt, Ont. The electrical machinery consists of two dynamos, one of approximately 400 h.p. and the other of 150 h.p.

The Cranbrook Electric Light Company purpose erecting a power plant on the St. Mary's river at an early date, and when that is in operation, the idea is to utilize the new building, under review, as an auxiliary distributing station, in the event of any break down at the St. Mary's river plant. The company's idea in erecting a steam power house of the magnitude described was that at no time should there be any danger of failure of electric supply through a breakdown. A steady supply of power is thus practically assured, ensuring the city against any such unpleasant experience as recently befell Lethbridge and that threw the city of Nelson into disorder some little while back.

It is interesting to note the growth and development of the Cranbrook Electric Light Company's works in the past decade, marking as they do in a very emphatic manner the steady growth and expansion of this city. It was in the winter of 1900 that the company first saw light, having been organized by a little band of enterprising and progressive citizens, included among whom were A. Leitch, Sr.; Jas.

Ryan, M. McInnes, J. H. King, M.D., W. A. Doble and George Bromner.

The plant then consisted of one 35 k.w. machine, and this satisfied requirements for a period of three or four years, when the plant was increased by another 75 k.w. machine. Later on, yet another 75 k.w. machine was added. With the growth of the city of Cranbrook and the evident rapidly increasing demands for both light and power ,the company realized that really important additions must be made to the plant, and last year a contract was entered into with the city council, whereby the company bound itself to supply continuously up to 600 h.p., and to have everything in readiness to place this supply at the disposal of the city by May 22nd of this year. Superintendent Maurice Quain is quite satisfied that by the date fixed he will be in a position to carry out the contract with the city in every particular.

The present officers of the company are: President, R. E. Beattie; Vice-President, Jas. Ryan; Directors: A. K. Leitch, J. H. King, M.D., V. H. Baker; Secretary, N. I. Harrison; Superintendent, M. Quain.

Fires from Electric Causes Decreased

The following letter has been addressed to the "Electrical News," by the Chief Inspector, Canadian Fire Underwriters' Association, in reference to the matter of defective electric wiring and resultant fires:

Toronto, Feb. 1st, 1910.

Editor, "Electrical News":

Dear Sir,—I have read with much interest Mr. Ginder's letter regarding electrical fires. Mr. Ginder must remember that the number of actual fires from electrical causes has materially decreased, but in admitting this fact it must be borne in mind that it is largely due to rules and regulations which have been formulated and enforced by the underwriters' and municipal systems of inspection throughout the civilized world. If my esteemed contemporary, Mr. Ginder, could see some of the dangers and attempts to install dangerous electrical work, which is the lot of the inspector, he would be rather inclined to ask for more assistance towards educating the public regarding the actual danger from defective wiring than to create an indifference thereto.

In the city of London, England, it is a penal offence to violate certain rules governing electrical installations, and in many large cities the same law applies. My policy is to use as much consideration and horse sense as possible in the enforcing of our requirements, but unless the presence of the inspector is felt in the community, and inferior work is got after, hard, I think Mr. Ginder would find that the fire loss would very rapidly increase. There is much to be said on this subject, and the electrical interests at large should not arrive at any hasty conclusions in reading the letter which I am referring to.

I quite agree with Mr. Ginder in one point, and that is that from a properly installed electrical system there need be little or no apprehension so long as it is kept in proper order and not allowed to be tampered with. It is a point upon which supply companies and inspection departments should meet and work hand in hand.

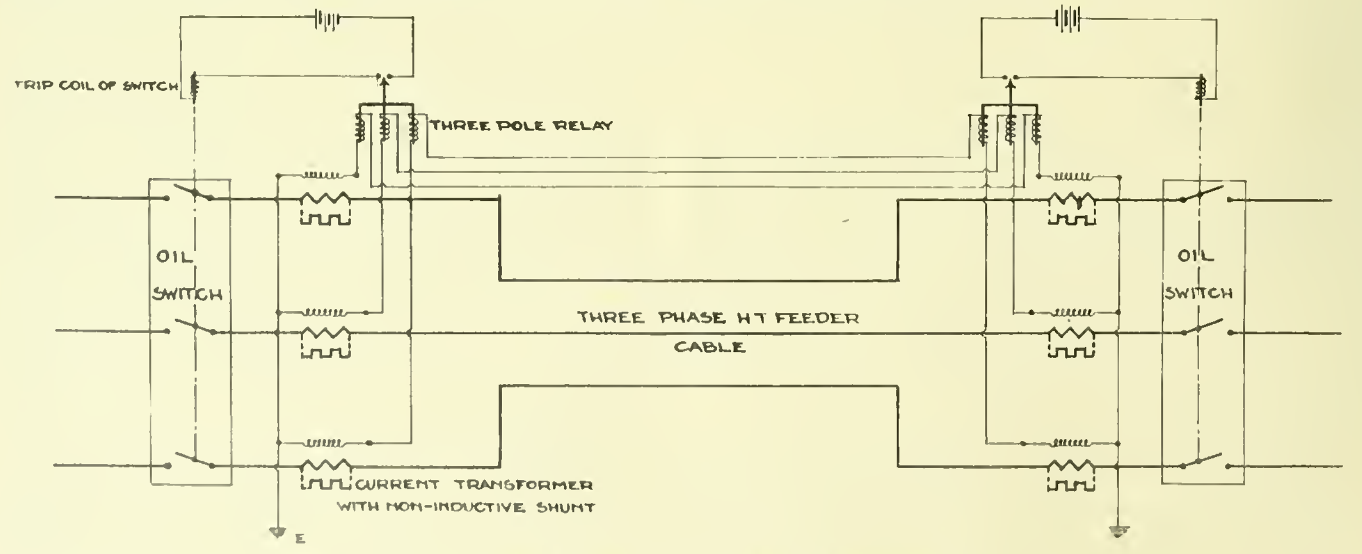
Yours very truly,

H. F. Strickland.

How to Render a High Tension Transmission Wire Harmless if it Breaks and Falls

The accompanying diagram indicates in a general way the plan that is being followed by the Hydro-Electric Power Commission to render a transmission wire harmless if it should break at any point between stations and the loose ends should fall to the ground. The drawing represents two consecutive stations, as it may be St. Marys and London, connected by three high tension transmission cables. Running parallel with these cables on a separate pole line (in actual fact the telephone poles are used) are three smaller wires, each of which is supplied with a weak current by small capacity transformers, one at either station, these being fed by one or other of the three main transmission cables, as shown. Each of these small circuits operates, at either station, one pole of a three pole relay used on occasion to close a short, strong, local battery circuit. In case of accident to one of the main lines, which will produce a marked change in the strength of the current through the small-capacity transformers on that particular line, a large momentary current is induced in the corresponding relay line which operates the relay at both ends and closes the two local battery circuits; these, in turn, excite powerful electro-magnets which open the main line oil switches at the two terminal stations. The relay lines, as will be seen, are star connected at each station and earthed.

It will be seen further, that this scheme of installation is a safeguard not only against breakages in the transmission cables, but also equally against short circuits. If two wires should by chance become crossed or otherwise short-circuited the result would be a sudden increase in current strength which would produce a corresponding instantaneous increase in the relay, so that the local circuits and the electromagnets would operate as before.


TRIP COIL OF SWITCH
THREE POLE RELAY
OIL SWITCH
THREE PHASE H T FEEDER CABLE
CURRENT TRANSFORMER WITH NON-INDUCTIVE SHUNT
E
OIL SWITCH

Relay System of rendering a broken High Tension Transmission Wire harmless.

The Calculation of Transmission Lines

Professor L. A. Herdt's Chart—Mr. A. J. Soper's Tables Facilitate the Work of Calculation—Mr. Blondel's Method Explained. (Continued)

By J. E. Dalemont

On the other hand, the line capacity has a special importance and must be taken into account where a phenomenon of resonance might take place. Let us suppose the case of a three phase transmission line composed of two parts, one overground, the other consisting of underground cables made up as follows:

A—40 miles overground wires of a diameter of .46 inches; distance between wires, 36 inches; mean height above ground, 300 inches.

B—20 miles underground cables of three cores of a diameter of .64 inches; $b=5$ inches, and $R=1.2$ inches.

The self induction coefficient per mile will then be equal to 1.709×10^3 henrys, and therefore the total self induction of the overground line will be 6.836×10^2. The preceding formula for calculating the capacity of three phase cables will give for the underground part of the line a total capacity of 3.344×10^6 farads.

We know that, if a phenomenon of resonance takes place, the pulsation of it will be $X = \dfrac{1}{\sqrt{Lc}}$, L and c representing respectively the total self induction and the total capacity of the line. In the present case it may be easily ascertained that $X=2090$, that is almost the pulsation of the fifth harmonic of a 60 cycle alternating current.

The formula which may be used to calculate the coefficients of self-induction and capacity of overground wires or underground cables being known, we will now consider the calculation of transmission and distribution lines where the capacity is negligible. Such a calculation does not present any difficulty. The very convenient method pointed out by Prof. Herdt and his chart recently published in the "Electrical News," is very accurate and will enable the electrical engineer to solve rapidly and accurately any problem which may arise.

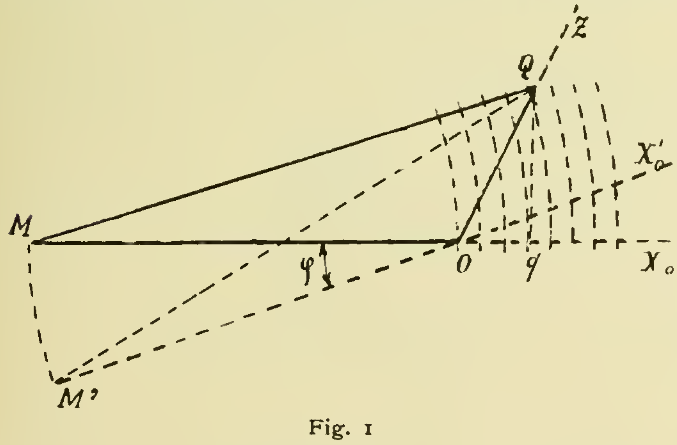


Fig. 1

In determining the tension drop in a reactive line where the tension at the start and the size of the wires used are given, a slight error may be introduced if the power factor is unity. The chart will therefore be more generally used for transmission lines than for the calculation of lines in a lighting system.

In the method pointed out by Mr. Soper, instead of a chart, tables very carefully calculated by this author, are used to facilitate the work in special cases.

In 1894, Mr. Blondel suggested a method giving an exact solution of each problem relative to the calculation of lines, where the capacity may be neglected, and more recently, the same writer, published a chart giving to this method a more simple and accurate form. This method follows:

Let M be the length of the line in miles, r the ohmic resistance per mile, l the self induction coefficient per mile, z the impedance per mile, R, L, Z, the total values of same for the entire line.

Tracing in fig. 1 the ohmic drop of the whole line, $rMI_1 = Oq$; then the reactance drop $Qq = \varpi eMI_1$, OQ will then give the total tension drop rMI, due to the inductance of the line.

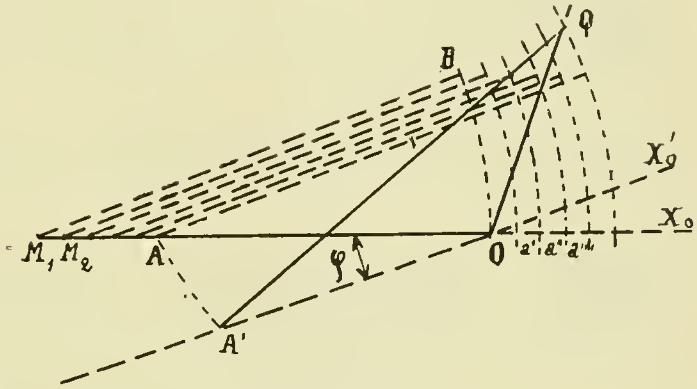


Fig. 2

If we now trace $M_1O = V_1$ the tension at the end of the line, assuming that it is in phase with the current, the tension at the start will be QM_1; or, again, if we trace $OM^1 = OM_1 = V_1$ in the case where the current lags an angle behind the tension, QM^1 will give the tension at the start.

We may therefore trace around the point M_1 the circles corresponding to different tensions at the start when the tension MO at the end of the line is constant. It is then easy to find the tension at the start for different total drops. On the figure, the circles have been traced in assuming $\phi=0$.

The problem may arise in an inverse form where we have to determine the tension drop corresponding to different values of current, such as, for instance, where the tension at the start is given as constant. Fig. 1 must be modified as shown in fig. 2. The point Q being determined as above, we may easily find the tension OA, tension at the end of the line, since we have QA the tension at the start.

In fig. 2, QA is traced assuming that $\phi=0$, but if the current lags an angle ϕ, behind the tension, we have to turn OA through an angle ϕ, so that $QA^1=QA$, and the tension at the end of the line will be OM^1.

We may then trace different circles, having the same constant radius equal the tension at the start and giving at the end of the line the tension OA or OM_1, OM_2, OM_3, etc., according to the different values of the current.

The Blondel chart is deduced from these two figures, and by means of it we may solve any problem; for instance, find the size of the conductor required to transmit a certain current to a certain distance with any tension drop whatever.

To trace the chart, the frequency being known, we first trace series of lines similar to OQ corresponding to the different sizes of conductors. The directions of these lines are deduced from the values of the resistances and the self-induction coefficients of the wires. The distance between wires which enters the formula for the self induction coefficient depends in each case on the previous distributing tension. The tension drop being proportional to MI, since $v = ZMI$, where M is the length of the line in miles, I the transmitted current, Z the impedance of the line, MI represents therefore a certain number of ampere miles. On each line of the series of OQ we may determine the points corresponding to the different numbers of ampere miles, and join together the similar points of the different lines.

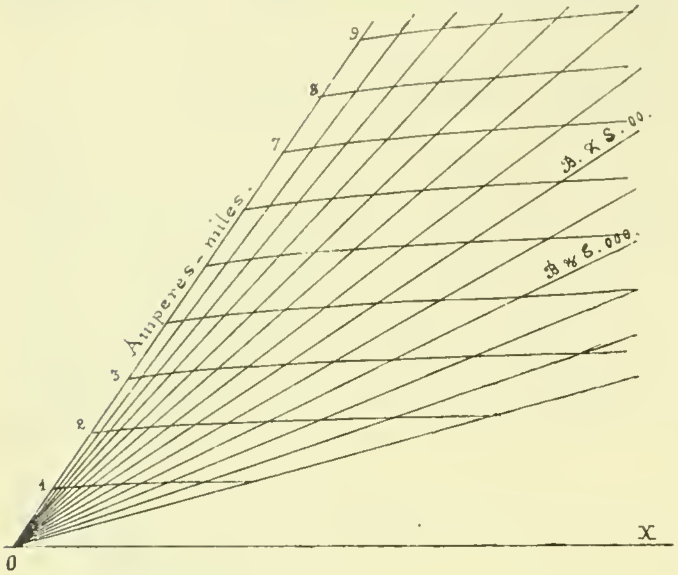


Fig. 3

Use of the Chart

Let us suppose that we have to determine the size of wire to be used to transmit the power P_1 at M miles under the same tension V volts, at the end of the line, the tension drop not exceeding 10 per cent. and the power factor being y. From these constants we may easily deduce the values of I and MI. We trace, then, on a plan the line $M^1O = V$ of the fig. 1, and from M, equidistant segments of circles, the radii of which are included between the values V and 1.1 V volts. Then, placing the chart on the figure, so that the points O and the lines OX and OX^1 coincide on account of the lagging of the current, the intersection of the MI ampere-miles curve with the circles corresponding to 1.I V, will determine the size of the wire to be used. For lower tension drop the other segments of circles will give the size of wire.

This method is especially useful in cases where many transmission lines supply at the same tension, the same substation, or when many distribution lines fed by the same tension radiate from the same point in different directions. In such a case, instead of using with the chart the diagram shown in fig. 1, we must use that of fig. 2.

(To be continued.)

The Electrical Properties of Flames

Roentgen Ray and Radium Properties Outlined—Great Advances in Recent Years—Flames Possess Unexpected Properties

It has been known since early times that if you rub a rod of glass with silk or a sheet of ebonite with cat's fur and then touch the glass rod or the ebonite to a gold leaf electroscope the leaves will stand apart as in fig. 1. In this state the electroscope is said to be charged with electricity. Further, if the gold leaves are charged and caused to stand apart using, say, a glass rod that has been rubbed with silk, and if this glass rod, having again been rubbed with silk, is brought near the electroscope, the leaves fall together; if, however, the ebonite, rubbed with cat's fur, is brought near the leaves they stand farther apart. This shows us there are two kinds of electricity; that produced on a glass rod rubbed with silk is called positive electricity; the kind produced on an ebonite rod rubbed with cat's fur is called negative electricity.

When equal quantities of the two kinds of electricity are brought together they neutralize one another and the combined effect is the same as if neither were present.

Other Methods of Discharging an Electroscope

If a charge of negative electricity be given to an electroscope by touching it with an ebonite rod that has been rubbed as explained above and the rays from an ordinary Roentgen tube be made to traverse the air in the immediate neighborhood of the charged electroscope, the leaves immediately fall. Similarly the Roentgen rays will discharge the electroscope if it carries a negative charge of electricity. Radium also has been known for many years to possess the same property as the Roentgen rays of discharging an electroscope either positively or negatively charged.

The foregoing phenomena of the discharge of an electroscope by the X-ray tube or by radium is the result of the production in the atmosphere, by these forms of energy, of both positive and negative electricity, one or the other of which, as the case may be, is attracted to and neutralizes the charge of opposite kind on the electroscope.

Theory of Ions and Solutions

The study of electrolysis in solutions and liquids many years ago disclosed the presence of an equal number of positively and negatively charged particles of matter which moved in opposite directions under the attractive action of the charged terminals. These charged particles were named ions. For example, a solution of NaCl under the action of an electrolyzing current contains ions of Na carrying positive charges and an equal number of ions of Cl carrying negative

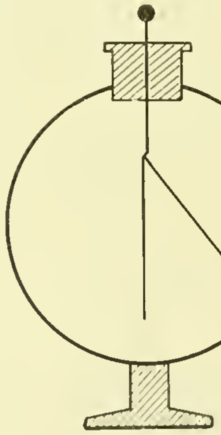


Fig. 1 -Charged Electroscope

charges of electricity. It was supposed that the energy of the electric current passing through the NaCl solution first dissociated the molecules of NaCl into ions and then by the directive action of the charged terminal plates drew these ions in opposite directions from the liquid—the positive ions to the negative plate and the negative ions to the positive plate. It has more recently been shown, however, that the presence of these ions is quite independent of the electric current; that every solution under ordinary conditions contains a certain percentage of ions, the percentage depending on the particular substance dissolved and the strength of the solution and that electrolysis is simply the removing of these ions.

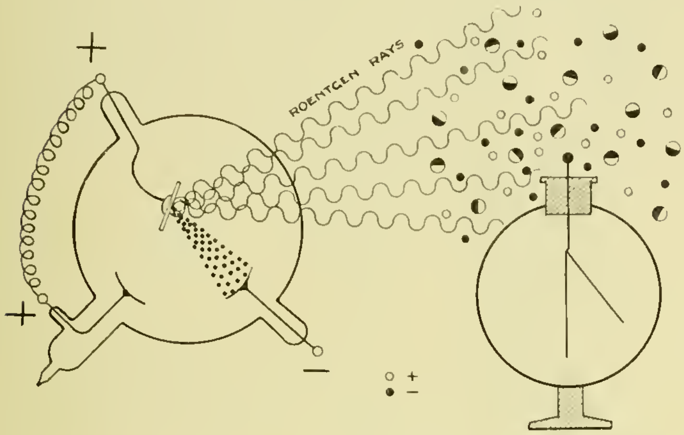


Fig. 2 Roentgen Rays Ionize a Gas

Roentgen Rays and Ions in Gases

It has been pointed out in the previous paragraph that the action of a solvent like water on a solid like NaCl is to dissociate a certain percentage of the particles of the solid into ions. Now, Roentgen rays and radium may be looked upon as standing in the same relation to a gas as water does to a solid—they dissociate the gas in part into positive and negative ions (fig. 2). These ions differ, however, from the ions present in electrolysis in that they are very unequal in size, one being about 1,800 times greater than the other. The electric charge carried by these ions is nevertheless the same in amount though opposite in kind.

How we prove the Actual Presence of Ions in a Gas

The question may be asked, how do we know there are ions? How do we know the air has been affected in any way? The best ocular proof probably that can be given of the actual presence of ions lies in the fact that a given volume of air having been subjected to the action of Roentgen rays or of radium may be carried from one part of a laboratory to another part and still retain its property of discharging an electroscope. The length of time during which the air retains this property is naturally very short owing to the rapid recombination of the ions with one another. The dissociated condition persists, however, for some seconds, and even minutes, under certain circumstances. Fig. 3 illustrates a piece of apparatus by the use of which is proven not only the possibility of carrying ions from one place to another, but also the fact of their rapid recombination.

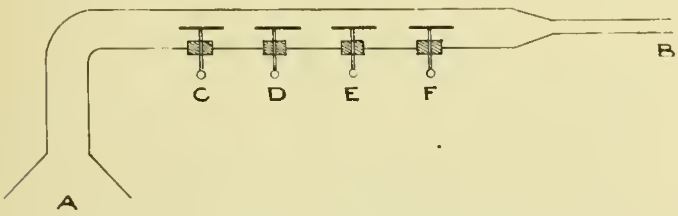


Fig. 3 To Show Ions Carried by Air Currents

Using this apparatus, a draught pump is attached at B, which causes a current of air to flow in at A past the plates C, D, E, F, and out at B. When a Roentgen tube is excited or a small quantity of radium placed in the vicinity of A, a charged electroscope attached at C, and the air current set flowing from A to B, the electroscope is immediately discharged. This result shows that ions are carried along by the current of air. If the experiment is repeated with the electroscope, however, attached to D, E and F in succession, the charge on the electroscope is dissipated in each case but in increasing lengths of time, showing that some ions recombined between C and D, some more between D and E, some more between E and F, and so on.

The Properties of Flames

The gases from flames, in somewhat varying degrees, possess the above properties of discharging an electroscope whether positively or negatively charged, and therefore the flame must, like Roentgen rays or radium, ionize the air in which it is placed that is, the combustion breaks up a percentage of the particles of air into smaller particles, half of which carry positive charges of electricity, the other half negative charges of the same size. This may be proven by repeating the experiment with the apparatus of fig. 3, but placing an ordinary bunsen burner instead of a Roentgen tube at the inlet of the apparatus. The electroscope carrying either positive or negative electricity will become discharged as before.

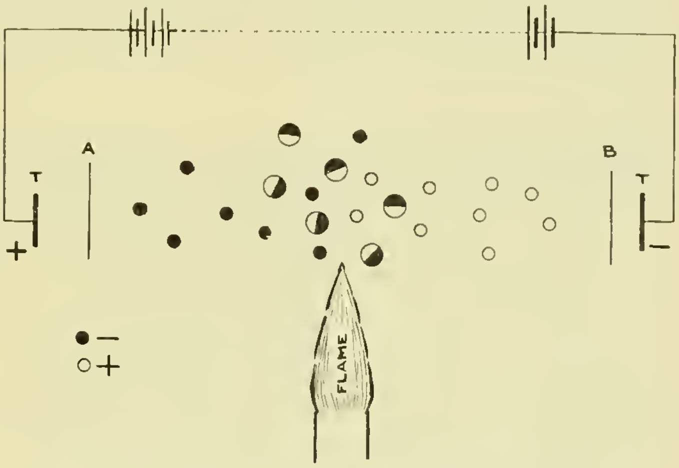


Fig. 4—Flame also makes a Gas an Electric Conductor

The same effect can further be shown in a very conclusive manner by an experiment as arranged in fig. 4. T, T, are the terminals of a battery composed of a considerable number of cells or the terminals of the secondary wires of an induction coil, so that one terminal is charged positively and the other negatively. If positively and negatively charged ions are produced in the area between T and T by a flame, the negative ions will be drawn to the left in the figure and the positive ions to the right. By placing an ebonite plate, uncharged, in the position B it can be readily shown, by its effect on an electroscope, that the plate takes a positive charge; similarly, it can be shown that the ebonite plate placed in the position A takes a negative charge.

The Law of Conductivity in a Flame

The results of the foregoing experiments, with many others of a similar nature, have led up to the modern conception that ionization and conductivity mean practically the same thing; if a liquid solution contains ions the liquid is a conductor of electricity; if a gas has been dissociated into ions by Roentgen rays or radium or the action of a flame that gas is, for the time being, an electric conductor. The question naturally arises whether conductivity in such a gas follows the general law of conductivity as stated by Ohm's law for solids, and the apparatus shown in fig. 5 can be used to demonstrate that conductivity at different points along a flame varies greatly. It has recently been proven by Prof. H. A. Wilson, of McGill University, when experimenting on flames, that the common law of $V = CR$ is not applicable and that the law is more accurately expressed by the equation $V = AC^2 + BlC$ where l is the length of the flame area and A and B are constants.

In fig. 5, Q, Q, are quartz gas burners which have the combined qualities of non-conductivity of heat, non-conductivity of electricity and very high melting point. T and T are conducted to the terminals of a storage battery of small cells. The electrical condition in the space T-T is determined by means of two movable exploring electrodes E, E, which are connected to a sensitive quadrant electrometer. By means of these electrodes it is shown that (1) there is practically no fall of potential near the positive end A and, (2), there is a very great fall of potential within a few millimetres of the negative end B.

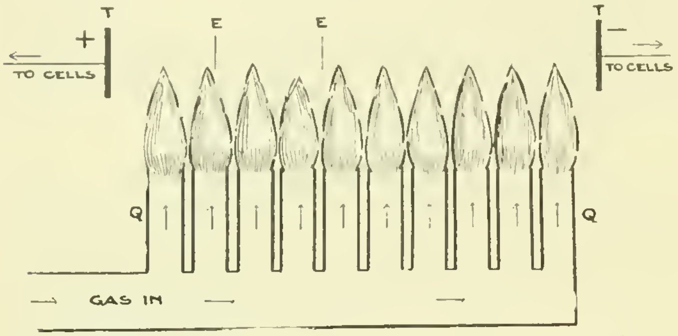


Fig. 5—Quartz Burners for Showing Law of Conductivity

In seeking to explain these phenomena it is recalled that the ions in a gas are of unequal size, the positive ion being about 1,000 times as large as the other. As a result, it is plain that, acting under equal forces, the positive ions will travel at a much slower rate than the negative ions; that is, an area filled with positive ions will offer a very much greater resistance to the passage of electricity than a similar area occupied by negative ions. Since it is in the area close to the negative electrode B that the positive ions will be most numerous, it is only natural that at this point the resistance should be greater and therefore the fall in potential also greater, as shown by the exploring electrodes.

Summed up, the characteristic properties of flames may be roughly classed under three heads:

1. A flame ionizes a gas in which it is burning, producing both positive and negative ions, and so makes the gas a conductor of electricity.
2. The conductivity of the gas under the influence of a flame, though marked, is not great, being only about 10^{-11} that of copper metal.
3. Conductivity in a flame gas does not follow Ohm's law, but is more nearly represented by the equation $V = AC^2 + BlC$ where A and B are constants and l is the length of the flame area examined.

Modern House Lighting with Low Voltage

Low Voltage Lamps Not Fragile—Special Transformer can be Used with Small Current Loss — Estimates of Relative Cost with Tungsten and Carbon

E. B. Walker.

Although the tungsten lamp has almost replaced the carbon lamp for the lighting of stores and large buildings, it has not so far had extensive use in Canada for lighting the ordinary dwelling, chiefly on account of its high candle power and its fragility, especially in the small sizes .

An ordinary room does not require large units of light, and it may be generally said that a number of small units distributed carefully, will give a more pleasing and artistic effect, besides being much better for the eyesight. Hallways too, should be kept lighted during the evening by a few low candle power units, but with a 5 c.p. 20 watt carbon lamp this hall lighting will mean an important addition to the monthly bill. The 100 to 130 volt tungsten lamp has offered little assistance to the ordinary house, as the smallest unit is about 18 watts, and therefore is useful only in the larger rooms, beside being rather too fragile to be used in a key socket or wall bracket where it is apt to be subjected to occasional vibrations, which go far to shorten its life.

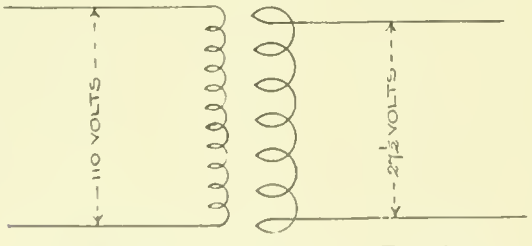


Fig. 1 Ordinary Double Wound Transformer

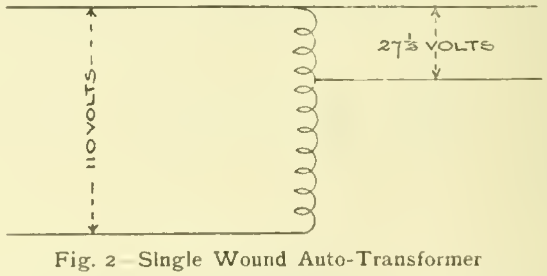


Fig. 2 Single Wound Auto-Transformer

The low voltage tungsten lamp offers a solution to these difficulties, and wherever alternating current is available, as is the case in most of our towns, it can be conveniently and cheaply used by means of a small transformer designed especially for low no-load losses.

Lamps—The lamps are made for 25 to 30 volts and can be obtained in the following sizes: 8, 10, 12, 15, 20, 25, 30, and 35 watts. Wherever a large number of lights are to be supplied, and perhaps higher candle powers desired, it will be preferable to use the 50 to 55 volt type, obtainable in 10, 12, 15, 20, 25, 30, 35, 40, 50, and 60 watt sizes.

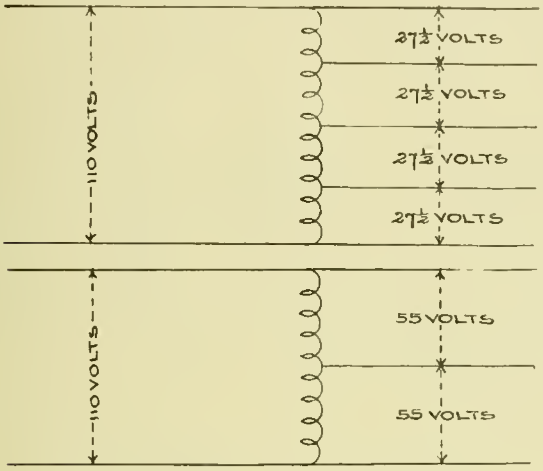
The 25 volt class have filaments about one-quarter of the length of the 110 volt sizes, and the 8 watt filament is about the same thickness as the 35 watt, 110 volt. Owing to these stout, short filaments, the lamp is very much stronger, and, in fact, may be safely used in desk lamps and other portables. It has been thoroughly demonstrated that these lamps have a much longer life than the 110 volt class, the average being about 3,000 hours for lamps in stationary fixtures, and even in railway car lighting, where they have extensive use, the average life is about 2,000 hours.

Transformers—The transformers for use with these lamps can be supplied for any voltage and frequency, and may be roughly divided into three styles of winding:

(1) The ordinary double wound transformer, fig. 1.
(2) The single wound auto-transformer, fig. 2.
(3) The balancing transformer, figs. 3 and 4.

The first type is recommended wherever the house wiring is not up to the present standard of insulation, as the lamp circuit is completely insulated from the line and the maximum voltage on the wiring is only 25 to 30 volts. Where old wiring has been condemned it would often be satisfactory and certainly much cheaper to use this type of transformer than to go to the expense and trouble of having the old wires torn out and new replaced.

This type has also extensive use in England in connection with a cheap form of exposed wiring where flexible cord armored with braided tinned copper wire is used, the armor forming one side of the circuit.



Figs. 3 and 4—Balancing Transformers

The second type is recommended for all ordinary installations up to about fifty 10 c.p. lights.

The third type is suitable for larger installations, as it has the advantage that only the out of balance current must be taken care of, and as long as this does not exceed the capacity of the transformer, the number of lamps is only limited by the capacity of the supply mains.

The standard transformer has a ratio of 4 to 1, and as the prevailing voltage in Canada is 110, the lamps should be about 27 volts, allowing one-half volt for line drop. Of course, the winding can be arranged for any voltage, but the 4 to 1 ratio has the advantage that it divides up in four equal circuits in the case of a balancing transformer, and consequently 27 volt lamps will suit either type.

In many cases these transformers are provided with taps for 105, 110 and 115 volt primaries, allowing adjustment to suit local conditions.

Automatic Transformer Switch

In using one of these transformers, there is a small but continuous consumption of current due to the transformer core losses. This amounts to from 5 watts up, and is sufficient to add considerably to the monthly bill. Of course, the transformer can be switched off during the day, but this would be rather troublesome, and on this account the automatic transformer switch has been developed, fig. 5.

While this switch costs as much, and sometimes more than the transformer, it is well worth the extra expense, as a continual loss of 5 watts would cost about $4.38 per year at 10 cents per k.w. hour.

As an example of the saving effected by the use of this system in a small house, we give the following: A house wired for 25 lights, and an average consumption of ten 10 c.p. lamps or their equivalent for three hours per night is assumed:

Carbon Lamps

First cost, 25 carbon lamps at 20 cents each	$ 5.00
Monthly operating cost: Ten lights at 35 watts for 3 hours per night, 30 nights per month - 10x35x3x30= 31,500 watt hours, at 10 cents per k.w. hour	3.15
Free carbon renewals assumed.	

Low Voltage Tungsten Lamps

First cost, twenty-five 27 volt tungsten lamps with transformer and automatic switch	35.00
Monthly operating cost: 10 lights at 12 watts for 3 hours per night, 30 nights per month=10x12x 3x30=10,500 watt hours; at 10 cents per k.w. hour	1.05
Transformer core loss=5x3x30=450 watt hours...	.045
Renewals, 900 lamp hours per month, at .025 cents per lamp hour	.225
Total monthly cost	$1.32

Saving per month = $3.15 – $1.32 – $1.83.
Difference in first cost = $35.00 – $5.00 = $30.00.
Or excess first cost of tungsten system is paid for in about 30/1.83, or 16.4 months.

After the equipment has been paid for in economy of current, the saving over the carbon system is in the proportion of same light for ⅔ cost, or 2½ times light for same cost.

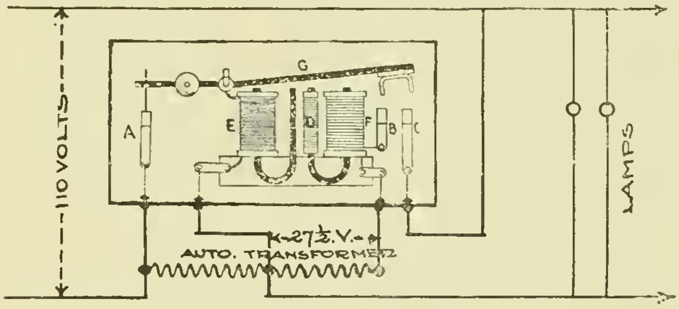


Fig. 5. Automatic Transformer Switch—On no load the windings are disconnected from the mains by the rocking armature G, which is weighted at one end. When a lamp is turned on, current passes from one of the mains through the lamp to the common terminal of the transformer, and by way of the windings of the pull-on magnet E, the armature G and the mercury cup A to the other main. The magnet E becomes energized pulls down G and makes contact with the hold-on magnets D and F, and with mercury cups B and C, at the same time breaking contact in the mercury cup A. The action is positive and there is no noise or chattering.

In the case of 200 to 250 volt circuits with the accompanying drawbacks of lower efficiencies and no small candle power carbon units, the saving is, of course, even more marked.

Beginning with the January issue, the two journals "Industrial Engineering" and the "Engineering Digest" are consolidated into one under the combined name. The managing editor of the new publication is Mr. R. T .Kent, who has had valuable journalistic experience, first as associate editor of the "Electrical Review," later as managing editor of the "Iron Trades Review" and, since its first issue, as managing editor of "Industrial Engineering."

The Sunbeam Incandescent Lamp Company, of Toronto, announce in this issue that they are manufacturing in Canada the Mazda lamp, which, it is claimed, constitutes the most recent and important development in high efficiency metal filament lamps.

Electrolysis—in Theory and Application

Theory of Electrolysis Explained—Application of Theory to Street Railway Practice How Troubles may be Avoided

SAUL DUSHMAN

If in a direct current circuit there be interposed a liquid conductor, such as a solution of salt in water, the latter is decomposed by the current. This may be illustrated by the following experiments:

(1) Some dilute sulphuric acid is put into a beaker and two platinum plates are partly immersed in the solution at a short distance from each other (fig. 1). The upper parts of the plates are connected by wires to a source of direct current (such as a battery or dynamo). It is observed that gases are evolved at the two plates, and by collecting the gas at each plate separately it may be shown that oxygen is liberated at A, where the current enters, and hydrogen at B.

(2) The plate A in the above experiment is replaced by one of copper On passing current through the solution, the copper dissolves, forming blue vitriol solution, while hydrogen gas is evolved at B as before.

(3) If the sulphuric acid is now replaced by blue vitriol (copper sulphate) solution, the same reaction occurs at A, but instead of hydrogen, copper is deposited at the plate B.

In each of these experiments there has been a decomposition of the substance in solution as a result of the electric current passing through it, and the phenomenon is therefore known as electrolysis (from the Greek words "elektron" and "luow," "to decompose"). Hence the substances whose solutions conduct the electric current in this manner are named electrolytes; furthermore, the plates by which the current enters and leaves the cell are desigated electrodes, the former being distinguished from the latter by the terms anode and cathode respectively.

The fact that the products of decomposition appear at the electrodes and not in the body of the solution leads to the conclusion that during the passage of the current one component of the electrolyte is transported towards the anode, while the other is transported towards the cathode. To these components or constituents has been given the name "ions" (literally means "wanderers"); also, it is usual to designate those migrating towards the anode as "anions," and the others are "cations." The latter evidently travel in the same direction as the positive current, while the former travel in the opposite direction, during electrolysis.

At the electrodes these ions may react chemically either with the material of the electrode or some substance in solution, as is illustrated in the accompanying table:

	PRODUCTS	ANODE METAL	ELECTROLYTE			CATHODE METAL	PRODUCTS
			ANION		CATION		
1	Oxygen Gas plus Sulphuric Acid	Platinum	Sulphate	Sulphuric Acid	Hydrogen	Platinum	Hydrogen Gas
2.	Copper Sulphate	Copper	Sulphate	Copper Sulphate	Copper	Platinum Copper Iron	Copper
3.	Chlorine Gas	Platinum	Chlorine	Sodium Chloride (common Salt)	Sodium	Platinum	Hydrogen Gas plus Caustic Soda
4.	Zinc Chloride	Zinc	"	"	"	"	"
5	Iron Chloride	Iron	"	"	"	"	"

In the first example, the two ions of sulphuric acid are hydrogen ion and sulphate ion. At the anode the latter reacts with water and gives oxygen gas and hydrogen sulphate (sulphuric acid). In the second example the sulphate ion combines with the copper and yields copper sulphate; since the amount of copper deposited at the cathode is in the same ratio to the amount of sulphate liberated at the anode as copper to sulphate in copper sulphate, it is evident that by using a copper anode just as much copper is dissolved by the current as is deposited at the cathode. That is, the strength of the electrolyte remains constant, and the net result of the electrolysis is a transferrence of copper from anode to cathode. This is of fundamental importance for nearly all processes of electro-deposition or electro-plating of metals.

Not only anions, but also cations may react chemically at the electrodes with some substance in the solution. In example 3, the sodium reacts with water, yielding caustic soda and hydrogen. [It must be distinctly noted that the ions are not the same as the chemical substances of the same composition; "copper ion" is just as much different from metallic copper as the blue crystals of copper sulphate are different from the red, lustrous metal which we recognize as copper.]

From the above examples, as well as numerous other cases of electrolysis which has been investigated, it is possible to draw the following conclusions:

During electrolysis, metals, hydrogen gas, and caustic alkalies are obtained at the cathode, while at the anode are obtained non-metallic elements and acids. When the latter consists of some metal like zinc, copper or iron, which is capable of combining chemically with the anion, it is dissolved (corroded) by the electric current. We can state this in another form: whenever one of the above metals is made positive towards a solution of some electrolyte, corrosion of that metal by the electric current is the result.

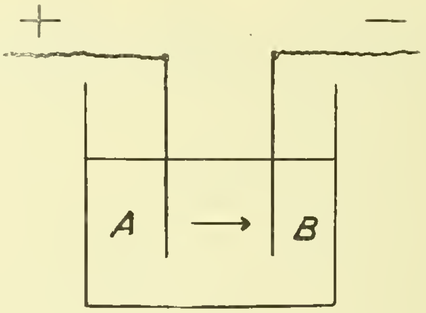


Fig. 1.

The next question that arises is this: At what rate is an electrolyte decomposed by the electric current? The experimental evidence here again has shown that the amount of chemical decomposition (e.g. the amount of copper plated out of a copper sulphate solution, or the amount of iron dissolved anodically in salt solution) is proportional to the product of current strength and time. For instance, a current of 1 ampere for 10 hours will deposit as much copper as 10 amperes in one hour, or 5 amperes in two hours, and so forth. This is the principle upon which is based the use of electrolytic meters. Either the amount of oxygen and hydrogen gases liberated by a definite fraction of the total quantity of electricity, or else the weight of metal deposited from a solution, is determined. It must be noted, however, that as these meters measure only the total ampere-hours, it is possible to calculate by this means the total watt-hours only in those cases where the voltage over the supply terminals is constant.

Application to water mains

We can now apply the principles which have been outlined above to an explanation of the causes of that type of electrolysis with which most electrical engineers are familiar—the corrosion of water mains, gas pipes and so forth, in the neighborhood of railway lines.

As is well known, electric street railways generally use direct current, the trolley pole being connected to the positive feeder of the generator. The current returns to the generator by means of the rails and numerous copper cables which are bonded to the rails at points where the current is apt to reach very high amperages. In fig. 2, the current leaving the generator G, passes through a motor H and enters the rails at B. The latter are bonded at the points c, d, etc.; at e there is connected a return copper feeder which joins the negative bus-bar at A. Between the points B and A there must exist a certain voltage drop which depends upon the resistance of the bonding points and also upon the current flowing between the two points. Now let us assume that close to the railway line under the ground is a water main, P Q. The current, then, has two paths in parallel, one along the rails, b c d e a, and the other through the ground and pipe. B K L e or B K M A. The latter, of course, has a very high resistance, which depends upon the nature of the soil (the more salts that are contained in it, and the more moist it is, the greater the conductivity) and upon the state of the insulation on the pipe P Q. Under certain conditions the potential difference between B and A may be so great that an appreciable current passes from B to K. The current passing along the pipe leaves it at points between L and M. It is evident that under these conditions the portion of the pipe between these points is positive towards the rail; that is, we have here a huge electrolytic cell similar to that shown in fig. 1, having the iron pipe as anode and the moist earth, with its dissolved salts, as liquid conductor. Electrolysis must therefore occur just as in the last example in table I. The various anions (such as chlorine, sulphate, and so forth) present in the ground, combine with the iron and cause it to be gradually corroded and dissolved. As the amount of this corrosion depends upon the product of current strength and time, it follows that even with small currents an appreciable disintegration of the pipes may result in time.

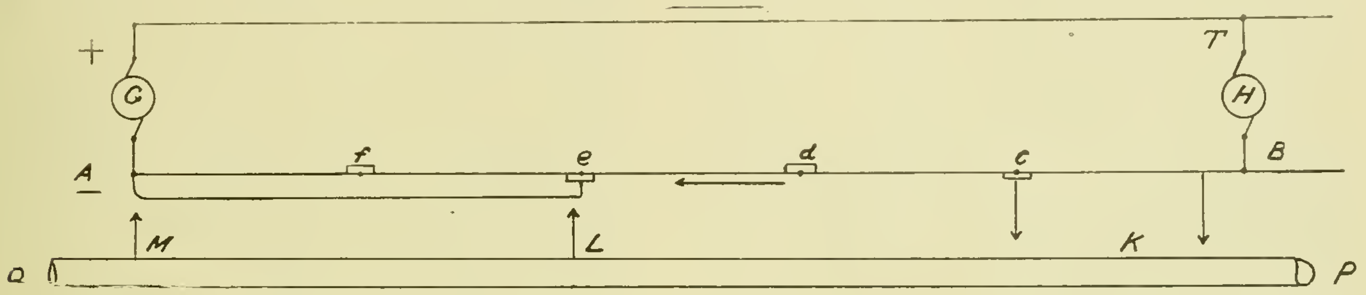


Fig. 2.

In connection with the recent electrolysis troubles in Winnipeg, Prof. L. A. Herdt, who was asked to report on the matter, suggested among other things, the remedies which are readily seen to be necessary from what has been stated above. One of these recommendations is that sub-stations should be installed at different points of the railway system. It is evident that, owing to the shorter distance which the return current would have to travel, the voltage drop, for given current, between any point on the line and the negative bus-bar would be diminished and consequently the amount of stray current through the water mains. Another recommendation made is special bonding and cross-bonding work at intersections as well as proper rebonding of all tracks that show defects owing to electrolysis (from the diagram it is evident that the rails at B and C must be corroded.) By extra good bonding the voltage drop between B and A is, of course, diminished. Prof. Herdt considers that a drop of one-half volt per 300 feet of rail is the maximum that ought to be permitted; but this maximum must evidently vary with the nature of the soil and the distance between rails and mains.

Replacing Open Arcs by Series Tungstens

Conditions can be Vastly Improved—Lamps Manufactured in Many Sizes — Costs of Operation Compared

Throughout Canada, and particularly in the smaller towns, there are many plants still operating open arc systems for street lighting purposes. While these have done valiant service in their day, there are now many installations where the conditions could be vastly improved by the introduction of more modern types of lighting units. In considering an improvement of these lighting systems, there are two questions of primary importance. 1st, how is the lighting effect to be improved? 2nd, how is the operating and maintenance cost to be reduced sufficiently to warrant the scrapping of the old lamps and replacing of the same with new? Since the tungsten filament incandescent lamp has been so widely advertised it is natural to turn to it for solution of these problems; and we shall in the present article consider its adaptability to the proposed system.

Take, for instance, cases where series arc machines of 9.6, 8.5, 6.6 or 4 ampere constant current type are at present in service. Here in many cases the machines are efficient and in good shape while the lines are all in place and in good order. All that is necessary, therefore, is to replace the arc lamp itself with a tungsten lamp and suitable reflector to distribute the light in useful directions. These lamps are made regularly in the following ratings: efficiency 1¼ watts per candle power:

Ampere range	Candle power	Av. watts per lamp	Av. volts per lamp
(1.7 to 1.8)	25	31¼	17.8
	32	40	22.8
	40	50	28.6
	60	75	42.8
(3 to 3.8)	25	31¼	8.9
	32	40	11.4
	40	50	14.3
	60	75	21.4
	80	100	28.5

(3.8 to 4.3) . . .	25	31¼	7.8
	32	40	10.0
	40	50	12.5
	60	75	18.75
	80	100	25.0
(5.1 to 5.9) . .	25	31¼	5.7
	32	40	7.3
	40	50	9.1
	60	75	13.6
	80	100	18.2
(6.1 to 7) . . .	25	31¼	5.7
	32	40	6.1
	40	50	7.6
	60	75	11.3
	80	100	15.2
(7.1 to 8)	32	40	5.3
	40	50	6.7
	60	75	10.0
	80	100	13.3

In addition to these, similar candle power ranges in amperages varying from 9 to 10, are made to special order. A 250 watt tungsten lamp in various amperages has also been put on the market. With it has been developed a special reflector which tends to concentrate the maximum light of approximately 250 c.p. between 8 and 25 degrees below the horizontal, which is ideal for street lighting purposes. This particular size is specially adapted for main street lighting while the smaller units are perhaps better for the residential districts, where they may be placed more frequently under the foliage of the wooded streets.

In the following tabulation you will find in condensed form figures comparing open arc lamps with various size tungsten lamps:

	Tungsten			Open arc
	40 c.p.	60 c.p.	80 c.p.	9.6 amperes
No. of lamps per mile to give minimum illumination of .024 foot-candles	60	12	32	10
Watts of energy per mile	3,000	3,150	3,200	4,800
Cost of energy per mile per year of 25,000 hours at 1c. per k.w. hour	$300.00	$315.00	$320.00	$480.00
Cost of renewals per year (2,500 hours) in case of tungsten; renewals, labor and maintenance in the case of open arcs	262.80	210.00	160.00	160.00
Total cost per year	562.80	525.00	480.00	640.00

These figures are based on an average series tungsten lamp life of 1,000 hours, which is very conservative. You will see from the above figures that in the case of 80 c.p. tungsten and 9.6 ampere open arc, there is a difference in annual operating cost of $160. This sum capitalized at 7 per cent. per annum and allowing another 10 per cent. for depreciation, would represent an investment of $941, which sum could be economically expended per mile on series incandescent street lighting equipment.

These figures are very conservative and, if anything, favor the open arc lamp. This, in addition to the fact that with the series tungsten lamps the advantage of even distribution is to be gained, as the direction of the light rays will not vary nor will there be a dark spot immediately under the lamp and a very bright one 25 or 30 feet away.

The above figures are based on results obtained with specially designed street reflectors for use with series tungsten street lamps.

Developments in Electrical Engineering

Notable Advances during Past Few Years—Suspension vs. Pin-type Insulators—Condenser Type of Bushing—The Synchronous Condenser Explained

P. M. Lincoln

The electrical art has made notable advances during the past few years in all lines and a recapitulation of such advances is not only interesting but instructive; it is the only manner in which we can obtain a proper perspective, which is of the utmost importance in judging along what lines future development will almost certainly take place.

It is manifestly impossible to treat, at this time, all the features of recent progress in electrical engineering; the best that I can expect to do is merely to touch the high places, so to speak. These I will take up in order and discuss at varying length, one by one, as they appear to me to stand in importance to the present-day electrical engineer.

Suspension Type Insulator—The two advances which, to my mind, are the most important in recent years, are the development of the suspension type insulator and the so-called condenser type of bushing for insulating the transformer coils and oil switches from their containing steel tanks. The suspension-type insulator is a necessary adjunct to the increasing high voltages now being used in many installations. The ideal high tension insulator is one which will allow excessive voltages to go over the surface without damaging the insulator, a function which it is almost impossible to obtain in any design of pin type insulator, for when an excessively high potential is applied to this type it very often punctures instead of going round. The suspension type, however, is very much stronger to voltages tending to puncture it than to those tending to arc over the surface; when it does break down, therefore, it is always an arc over the surface and not a puncture. Also, the individual parts of the suspension type insulator are not so large as the individual sections of the pin type, and an arc travelling over its surface is not so apt to break off a petticoat and so damage the insulator. The suspension type also has a tremendous advantage in that the total voltage across the insulator is much more evenly divided among the various porcelain sections than it is possible to get with any pin insulator.

The Condenser Type of Bushing—There is another tremendous advantage secured by using the underhung insulator—the insulation can be carried to almost any desired extent by merely using a sufficient number of underhung sections in series and the limitation of line insulation is transferred to the terminal apparatus. This apparatus consists essentially of transformers and switches, for both of which steel tanks, as containers, is the universal practice. Since it is practically impossible to insulate these steel tanks from the ground, it becomes necessary to insulate them, within, from the high tension conductor by a solid mass of insulation so that the admirably performed by the so-called condenser type of bushing which enables us to insulate a steel tank from a high tension conductor by a solid mass of insulation so that the voltage strains through this solid mass of insulation and is so distributed that the voltage stresses across one lamina of insulation are not materially different from the voltage stresses across any other lamina.

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*Extract from paper read before Toronto Section A.I.E.E.

Steel Towers—The use of steel towers instead of wooden poles, for transmission lines, has the very important advantage that thereby the number of insulators can be very largely reduced; also the cost is not materially increased over that entailed by the use of wooden poles and is actually decreased for many individual cases.

Electrolytic Lightning Arrester—No lightning arrester can absolutely guarantee freedom from lightning troubles, but it is my opinion that the electrolytic lightning arrester can come as near this as any that has been made. By the use of this type the voltage of a surge which may enter terminal apparatus is limited to a comparatively small excess over the normal voltages. The use of the guard wire over lines has also been largely adopted and is very generally credited with being an efficient safeguard against disturbances due to lightning.

Illumination—The tungsten lamp has entered the lighting field and has placed a very serious problem before those engaged in the illumination business. Instead, however, of being a menace to the situation, as many central station operators are inclined to view it, I believe that the tungsten lamp has served a tremendously valuable purpose in that it places an additional weapon in the hands of the central station operators, so that they may still better compete with other sources of illumination. The problem that this lamp introduces on account of its much smaller consumption of power is, in my opinion, only a temporary one.

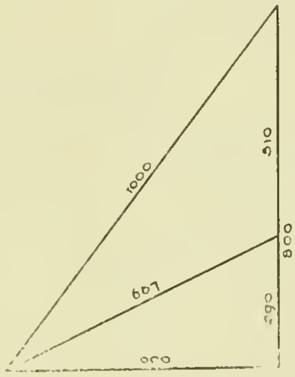
Exhaust or Low Pressure Turbine—In the central station field the exhaust or low pressure turbine has proved itself a device that has come to stay. There is a large amount of energy left in the steam which is exhausted by the ordinary reciprocating engine. The reciprocating engine works between a boiler pressure of from 150 to 200 pounds down to practically an atmosphere pressure: the turbine takes this steam and gets almost the same amount of power out of it as has already been developed. There are many cases in which such a power producing device works to great advantage. In one particular case which the writer has in mind not only has the capacity of the plant been largely increased by the addition of exhaust turbines, but at the same time the relative cost of operation will be reduced. With reciprocating engines alone this plant took something like 2.4 pounds of coal per k.w.h.; with the addition of exhaust turbines it is estimated that the capacity of the plant will be increased at least 75 per cent. and the consumption of coal reduced to not more than two pounds per kilowatt hour.

The Synchronous Condenser—Another device which has found increasing favor among central stations during the last few years is the so-called synchronous condenser—the result of a proper recognition of the effect of a low power factor. A short time ago it was customary to equip prime movers with alternating current generators just large enough to tage care of the prime movers when the power factor of the load was 100 per cent. Such stations would become loaded up with a load with power factor averaging as low as 60 per cent. The central station engineer would then find himself in the predicament of being obliged to run the prime mover at a point not very much beyond half load in order to avoid overloading and overheating the generators.

A synchronous condenser is simply and alternating current generator which runs idle on an alternating current line with an over-excited field. This over-excitation of the field causes a leading current to flow through the generator, thereby neutralzing a certain amount of the current which otherwise would have to flow through the generators attached to the prime movers. A low power factor means that there is a certain idle current circulating around through the system; so long as it has no other path, this idle current must circulate through the generators attached to the prime movers. The installation of a synchronous condenser provides for this idle current another path; it is thereby shunted off the main generators and caused to pass through these separate generators. The power factor of that portion of the load which passes through the generators attached to the prime movers is thereby increased and the increase may be up to any desired extent.

By the use of such synchronous condensers, central station engineers may increase the load carried by the prime movers to such a point that the prime mover may operate at a much more economical point. Ordinarily a prime mover is so chosen that it will operate at its most economical point when the generator attached thereto is at its full load point; if the power factor is low, say 60 per cent., then when the generator is operating at full load the prime mover is operating at 60 per cent. The power factor on the prime mover cannot be increased without danger of overheating the generator, consequently the central station must either put up with a prime mover operating at 60 per cent. of the full load (a relatively inefficient point), or apply the obvious remedy of using a synchronous condenser.

The question is often asked as to the size of synchronous condenser necessary for increasing the power factor of a given load a given amount. A simple analysis shows that this is really a very simple problem. True power loads can be added and subtracted directly. Also the wattless components of these true power loads can also be added and subtracted directly. Loads expressed in kva, that is, a combination of true power and wattless components, cannot be added and subtracted. For this reason, in order to answer the above question, it is necessary to resolve the quantities involved into true power and wattless component elements. Having so resolved them, we can make whatever additions and subtractions to the wattless or real elements we wish.



For instance, assuming a load of 600 true k.w. at 60 per cent, p.f. This will mean a load of 1,000 kva, that is, the volts times the amperes amount to 1,000 kilowatts. The wattless elements of such a load would be 800, in other words, the square root of 600^2 plus 800^2 equals 1,000. Suppose we wish to install a synchronous condenser of sufficient capacity to raise this power factor from 60 to 90, what size synchronous condenser will be required?

The wattless element of a 600 k.w. load at 60 per cent. p.f., is as mentioned above, 800 kva; the wattless element corresponding to 600 k.w at 90 per cent. p.f. is $(600 \times \frac{100}{90})^2 - (600)^2 = 290$ kva. Subtracting 290 from 800, we have the result that it will require 510 kva in synchronous condenser capacity to make the desired correction.

This result may be shown very readily in the accompanying diagram:

An inspection of this diagram shows at once that the total generating capacity when using synchronous condensers is greater than if all of the generating capacity had been placed in the original generators. It is simply a question that the shortest distance between two points is measured on a straight line. Any departure from the straight line measurement must necessarily lead to a greater total. In the case cited it will require 1,000 kva to take care of this load if the original generator is used at 60 per cent. p.f. If the original generator is used at 60 per cent. p.f. and a synchronous condenser installed, the total generating capacity required will be 1,177 kva instead of 1,000 kva, or an increase of nearly 18 per cent.

There are only two cases where synchronous condensers will be applicable. One of these is where the plant is already in and it is practically impossible to install new generators. In many cases the prime mover attached to generators are capable of turning out considerably more power and at considerably higher efficiencies than the smaller capacity of the generators will allow. The limitations come in the heating of the generators and not in the capacity of the prime mover to carry the load. Under such conditions it is quite possible to install synchronous condensers without disturbing the original generating equipment, and the capacity of the prime mover may be used to a much greater extent by this simple lightening of the load which it is necessary to carry on the generators.

The other case where it may be advisable to use synchronous condensers is where a comparatively large load of low power factor is contemplated when that load must be carried by a plant situated some distance away. Suppose the load be at as low a power factor as 50 per cent., then it would be necessary to install step-up and step-down transformers and also transmission line of sufficient capacity to carry the necessary amperes at this low power factor. It is quite possible to raise this power factor to 100 per cent. by the use of synchronous condensers, in which event the installation of transformers and transmission lines would have to be only one-half that in the first case. The saving, therefore, in transformers and transmission line may be a sufficient offset to the synchronous condensers required to make them desirable.

Another advantage which may be obtained by the use of synchronous condensers is the ability to regulate the voltage at the point where they are installed. It is well known that it is quite possible to shift the phase angle of the drop in transmission lines and transformers by changing the power factor of the load taken through them. This shifting of the phase angle will enable one to adjust the drop merely by means of taking more or less current through synchronous condenser attached to the transmission line at a given point. This possibility is an important one and its application in cases of long distance transmission may become of considerable importance.

Telephone Department

The British Columbia Telephone Company

Tremendous Development in Recent Years—Cheapest Rural Service in North America—To Lay Second Cable

J. V. McNaulty

The British Columbia Telephone Company, with headquarters in Vancouver, operates telephone lines in Vancouver, Victoria, New Westminster, North Vancouver and practically every large centre of population on the lower mainland of British Columbia, on Vancouver Island, and in a number of the cities and towns of West Kootenay and Boundary districts, besides furnishing long distance service from the coast cities with all points in the State of Washington and gulf islands; it also operates a number of rural lines throughout the lower mainland agricultural districts. Vancouver, the home of one-third of the population of British Columbia, is the centre of the telephone company's activities, and its largest business is conducted in Vancouver, where it has no less than 8,000 telephones connected with its central exchange.

The business of the company has undergone tremendous growth during the past decade in all parts of the province where it has installed its system That the management of the company is thoroughly alive to the demands and requirements of the constantly increasing business passing over its local and long distance lines is evidenced by the tremendous development and improvement which all parts of the system have undergone in recent years. By the adoption of a most progressive policy the company has been able to keep abreast of the demands for the extension and improvement of its service throughout British Columbia, due attention having been paid to the requirements of towns and rural districts as well as to the greater needs of the larger centres of population.

To Lay Second Cable

Several years ago the company felt the necessity of linking up its system on Vancouver Island with the mainland, the result being the laying of a cable across the Strait of Georgia via the islands in the gulf. Since this cable was placed in operation the business handled over it has grown so rapidly that a second cable will be laid during the coming summer; it will practically follow the route of the first one. To date the lines of the British Columbia Telephone Company on

B. C. Telephone Company Exchange, 1908.

Vancouver Island serve the cities, towns and rural districts along the east coast as far north as Courtenay, from which point it is possible to talk with a still more northerly point, Campbell river, over the telephone line built several years ago by the Dominion Government.

Because of the rapid development of Vancouver Island in that district lying between Nanaimo and Alberni which will follow the completion of the extension of the Esquimalt & Nanaimo Railway from the former to the latter point next year, it is the intention of the telephone company to extend its system to Alberni, a town at the head of Alberni canal ,on the west coast of the island. The company's lines are now at Parksville, and the extension to Alberni will involve the construction of some 20 miles of line. The extension of the railway to Alberni will probably be completed within a year, and as it is the policy of the railway company to promote sttlement along its new branch, the demand for telephone service throughout that district may be expected to reach paying proportions within a few years.

Cheapest Rural Lines

"It may be a surprise to a great many people to learn that the British Columbia Telephone Company is to-day supplying the best and cheapest rural telephone service in North America," remarked Mr. George S. Halse, secretary-treasurer of the company, while discussing the service which is being furnished to farmers in the districts through which the company's lines run. "Our charges for telephones on rural lines are $18 per year, and we limit the number of instruments on any line to five; compare this with the charge of $20 made by the Provincial Government-owned lines of Manitoba—and in that province ten instruments are placed on lines in the rural districts."

Besides serving the cities of Vancouver, North Vancouver and New Westminster on the lower mainland, the company's long distance lines furnish connection between those points and the following places, where local services are also maintained: Abbotsford, Chilliwack, Eburne, Hammond, Ladner, Langley, Mission City, Port Moody, Steveston, Aldergrove, Barnet, Blaine, Clayburn, Cloverdale, Clover Valley, Haney, Hazelmere, Huntingdon, Lake View, Fort Longley, Langley Prairie, Matsqui, Pitt Meadows, Pitt River, Ruskin, Silverdale, Sumas City, Upper Sumas, Westminster Junction and Whonnock. Extension of the company's lines from Chilliwack across the Fraser river and into the town of Agassiz and surrounding district is planned to be carried out during the coming summer.

Long Distance Service

In connection with its cable under the Strait of Georgia and across the islands of the gulf to Victoria, the company also furnishes, from any point on its coast service ,communication with Orcas Island, San Juan Island, Shaw Island and Lopez Island. On the eastern coast of Vancouver Island, where there is considerable settlement, service has been extended to Salt Spring, Pender, Galiano and Mayne Islands.

An excellent long distance service is now furnished between Vancouver and Seattle, the British Columbia Telephone Company having just completed the installation of a direct wire. When connection with Seattle was established some years ago, the service was furnished through the Bellingham exchange of the Pacific States Telephone & Telegraph Company, with the result that patrons in Vancouver and Seattle were often inconvenienced through having to wait till Bellingham reported the through line clear of local business. To overcome all possible delays and furnish the best possible service, the company made arrangements for a direct wire to Seattle for the sole use of long distance traffic. Connection between Vancouver and Bellingham is also direct. All points in the State of Washington are rendered available through interchange of traffic between the British Columbia Telephone Company and the Pacific States Telephone & Telegraph Company.

In Vancouver, where the capacity of the service maintained is practically unlimited, arrangements are being made for the installation of the first of four branch exchanges which it is contemplated to conduct in the eastern and southern portions of the city at points far removed from the central exchange, located in the company's new fireproof building on Seymour street. The first of these branch exchanges will be opened on Mount Pleasant, at the corner of Tenth avenue and Prince Edward street. The wires on that part of the system which this branch exchange will serve are now being led to it. The date of the opening of this branch has not yet been determined. Of the three other exchanges, it is planned to locate one in the Cedar Cove district, at the extreme northeast of the city; another will be situated at the head of False creek, and it is probable that one will be installed somewhere in the West Fairview or Kitsalano districts.

Government Ownership

In all the large centres of population in West Kootenay and Boundary, the British Columbia Telephone Company maintains exchanges, but there is no connection between the coast and those points. It is estimated that at a cost of not more than $200,000 a line could be constructed from Vancouver to the West Kootenay via the Coquahalia Pass through the Hope Mountains, with branch lines in the Nicola, Similkameen and Okanagan Valleys. Such a connection would be of the greatest benefit to coast commercial interests, as at present no inconsiderable amount of business is diverted to Spokane, with which city the West Kootenay has direct telephone connection. At present there is not sufficient local business along the route which would be served by the construction of a line from the coast to West Kootenay via the Hope Mountains to warrant construction, except with government aid. In the future when the country traversed by such a line is developed to the point where construction would pay a private company, it is probable that the British Columbia Telephone Company will build the line unaided.

In view of the fact that at present there is considerable talk on the question of government ownership of all telephone lines in British Columbia, it is interesting to note that the assets of the British Columbia Telephone Company in all parts of the province are valued at approximately $3,500,000. This valuation includes land lines, cables, general equipment, exchanges, buildings, real estate and such other property as is necessary to the handling of the business of the company.

Change in Address

The Helion Electric Company, Toronto, formerly in the Ogilvie Building, 63 Bay street, has moved to No. 2 Agness street.

Conduits Company, Limited, J. Herbert Hall, manager, Toronto, has moved from the foot of Berkeley street to 120 Don Esplanade.

Dawson & Company, Limited, Montreal and Winnipeg, the electrical street railway and mill supply house, announce the removal of their Montreal offices and supply rooms from 148 McGill street to larger and better equipped quarters at 56 Albert street.

United States water powers are listed in a pamphlet to hand from the United States Geological Survey, which deals with the conservation of water resources and the water powers of the country. It is stated that out of 37,000,000 h.p. available in water power at the minimum flow of streams, but little more than 5,000,000 h.p. has been developed, or about one-seventh of the minimum available power. The State of New York has the largest development, with 885,862 h.p., California next with 466,774 h.p. The publication presents statistical tables of water powers covering all sections and States.

Montreal and Eastern Canada

Shawinigan Water & Power Company

The annual meeting of the Shawinigan Water & Power Company was held in Montreal on Jan. 31st, 1910. The report of the board of directors showed the gross income for the year's operation to be $891,171, an increase of $112,927 over the previous year. It is a matter of interest to know that this increase in gross earnings is based on the sale of a less amount of power than was necessary to produce the same result in previous years.

President Aldred's report outlined the work done during the past year, and reviewed the business conditions that had existed. All the local industries at Shawinigan Falls are practically operating at full capacity and a new company, to be known as the Shawinigan Cotton Company, has arranged to erect a manufacturing plant. When the new 4,000 h.p. electrical unit is installed the developing capacity of the plant at Shawinigan Falls will be 55,000 electrical horse power. With the utilization of the storage resources of the watershed of the St. Maurice river, along which lines substantial progress has been made, it is estimated that 150,000 h.p. can be developed. From curves submitted by the engineering department it can be seen that every use has been made of the available power. Comparing the normal capacity of the electrical generating apparatus with the total amount of power generated, the extremely high load factor of 65 per cent. is obtained, as the average for the year's operation.

Mr. Julian C. Smith.

The election of officers for the ensuing year resulted in the re-election of the old board of directors, with Mr. Howard Murray, the treasurer, elected to the directorate to fill the vacancy caused by the resignation of Mr. J. N. Greenshields.

The appointment of Mr. Julian C. Smith to be general superintendent and chief engineer of the Shawinigan Water & Power Company was announced at this meeting, and places Mr. Smith officially at the helm of all the engineering interests of this large power company. For some years Mr. Smith has been general superintendent of the company and the new arrangement by which he assumes in addition the charge of the engineering office does not come as a surprise to those who have watched the successful operation of the Shawinigan departments which were under his direction.

Mr. Smith was born in Elmira, State of New York, about 35 years ago, and after a preliminary high school education, devoted his energies to the electrical engineering course of Cornell University. He specialized in hydraulic work and after graduation from that well known institution became associated with the engineering office of the late Mr. Wallace Johnson, who at that time was extensively connected with Niagara power development work. The experience gained here proved invaluable to Mr. Smith, and his advancement in the engineering profession was rapid. When Mr. Johnson was appointed consulting engineer for the Shawinigan power development project, Mr. Smith in time was transferred to the scene of operations as assistant engineer. This was eight years ago. The work at that time was not by any means completed, and it was by Mr. Smith that the first transmission line was placed in operation, carrying a voltage higher than had been previously exploited in that section of the world.

In addition to his work for the Shawinigan Water & Power Company, Mr. Smith has been consulting engineer for the Maritime Coal, Railway & Power Company, of Amherst, N.S., and in the past few years has planned considerable work for them. The various subsidary companies of the Shawinigan Water & Power Company are also under his general direction.

Mr. Smith is a member of the American Institute of Electrical Engineers and an associate member of the Canadian Society of Civil Engineers, and from time to time has contributed valuable papers before the meetings of both these societies.

Western Canada Power Company

Mr. G. F. Hayward, the general manager and chief engineer of the Western Canada Power Company, Vancouver, B.C., was in Montreal recently and awarded several contracts in connection with power developments which his company have under way at Stave Lake, B.C. As the result of Mr. Hayward's visit, the Canadian General Electric Company, Limited, will supply the generator requirements for the first development of 20,000 horse power. Two units will be built for this purpose and will be horizontal, two bearing type generators, each one weighing approximately 165 tons. These machines will be driven by Escher-Wyss turbines, which were contracted for some time previously. Ten 3,000 k.w. transformers which the company require, will also be supplied by the Canadian General Electric Company, and it is expected that the contracts for steel towers and insulators required will be awarded shortly through the company's purchasing agent, the Montreal Engineering Company. Mr. Hayward states that considerable progress has been made on the excavations for the forebay. Their power house is being designed to contain four units, although only two will be installed at present; the system will be operated at 60 cycles.

Their 60,000 volt transmission line into Vancouver will be 35 miles in length. The two circuits will consist of No. 00 copper wire, and will be carried on steel towers. To get their freight in to where the development is taking place, the company will have to construct six miles of railway line.

To Consolidate Quebec Merger Properties

Mr. R. S. Kelsch has been retained by the Quebec merger interests to consolidate the various properties now controlled by the merger. The various works consist of the properties of the Canadian Electric Light Company, the Quebec Railway, Light & Power Company, the Jacques Cartier Light.

Heat & Power Company, the Frontenac Gas Company, and the Quebec Gas Company.

The different electric companies are at present using different systems of frequencies, voltages, phase, etc., and the operation of all plants will be re-arranged and unified. This arrangement, when completed, will result in a greatly reduced operating cost and at the same time a greatly increased capacity will be effected. At the present time there are eight electric plants and two gas plants. Indeed, the situation at the present time is very much similar to the conditions that existed in Montreal when the Lachine Company and the Royal Electric Company amalgamated, which properties were also consolidated under the direction of Mr. Kelsch. Work will be started at once and completed within one year. About $500,000 will be expended, and when the work is finished, Quebec will have one of the finest properties in the Dominion.

Electrical Association of Quebec

The members of the Electrical Association, Province of Quebec, held their first annual meeting in the Association's rooms in Montreal on Feb. 10th. and an extensive report of the year's progress of the new Association was received, which evidenced the satisfactory strides made since its inception.

Mr. M. Rubenstein.

The Electrical Association, Province of Quebec, was organized on January 22nd, 1909, with a charter membership consisting of about twenty members of the electrical trade in Montreal, who felt the need of an organization independent of the Builders' Exchange, to protect their particular interests. Prominently identified with the new movement was Mr. E. W. Sayer, who subsequently was elected president, and who has always been a faithful worker for the new Association. Through the activity of the president and his able executive committee the Association has been able to greatly further the general interests of the electrical trade. The small contractor has, thanks to reforms adopted by supply dealers at the suggestion of the Association, had his position greatly strengthened. It is a source of satisfaction that the changes effected have been equally beneficial to dealers and contractors. During the year the Association has worked in unison with the Canadian Fire Underwriters' Association, and Mr. James Bennett, their chief electrical inspector, has from time to time addressed the regular monthly meetings. An interesting lecture on the important rules to be observed by wiremen was also delivered by this gentleman before the wiremen of Montreal. A strong feature of the Association's work in Montreal has been the informal monthly gatherings where the electrical fraternity could meet in friendly intercourse and discuss and amend any grievances. An instructive lecture on tungsten lamps was delivered during the season by Mr. J. M. Robertson. As a result of these meetings there exists between the members of the electrical trade in Montreal, a much strengthened bond of union.

The election of officers for the ensuing year resulted as follows: President, M. Rubenstein; Vice-President, J. D. Lachapelle; 2nd Vice-President, C. J. Young; Treasurer, W. B. Shaw; Secretary, C. C. Bothwell; Executive Committee: N. Simoneau, C. G. Matthews, J. M. Walkley, Clarence Thomson, J. A. Valois, L. Rousseau, J. A. Hicks, J. R. Meadowcroft.

Among the important questions which the new executive expect to deal with during the coming year is the matter of a compulsory apprenticeship course for wiremen. The loss sustained by contractors through incompetent wiremen and improperly trained helpers in the course of a year is enormous, and the Association will attempt to obtain legislation to remedy this evil. The matter of electric lighting companies connecting up an installation without first having certificates from the Underwriters' Bureau, showing that an inspection has been made, will also come up for consideration, while the following grievances under which contractors are at present working will be discussed: General contractors calling for tenders and using quotations unfairly; foreign contractors coming into Canada and bringing with them foreign labor and material; the weeding out of tramp wiremen; wiremen doing work after hours at cut rates. The consideration of organization for mutual protection against troubles from any source will also be taken up.

Montreal Street Railway Company

The Montreal Street Railway Company has introduced a new snow plough for service on the Montreal streets. The new plough is a combination of a snow leveller and scraper, the main feature being the extensive sweep of a projecting arm or wing. These wings are mounted on standard flat cars and are made of a heavy boiler plate sharpened at the bottom and slightly curved on their width of approximately two feet. The lower or cutting edge consists of inserted sections of cast steel plate bolted to the wing, and which can be removed for resharpening. These wings are strongly reinforced and are kept in place by their own weight of 1,000 pounds and a spring of 5,000 pounds capacity. They are operated by a special gear on the car body and can be set to sweep at any distance up to ten feet from the outer rail. The new plough has not only been serviceable to the railway company, but has also helped to keep the city roadways practically level for traffic.

The Montreal Street Railway Company also recently added a funeral car to its equipment. The new hearse-car is for service to the Protestant cemetery at Hawthorn Dale, a distance of about three miles from the centre of the city. Caskets are carried on three days a week, mourners making use of the ordinary cars of the company.

Allis-Chalmers-Bullock Busy at Rockfield

Allis-Chalmers-Bullock, Limited, are busy on both lighting and power transformers. Among recent orders was one from the Dominion Nickel Copper Company for three 600 k.w. oil filled, water cooled transformers, to step up the voltage from 2,300 to 33,000, at Sudbury; and six 275 k.w., oil filled, self cooled transformers, to reduce the voltage from 33,000 to 575, in order to operate motors at Moose Mountain.

The Algoma Steel Company, of Sault Ste. Marie, has given this company a large order for electrical rolling mill equipment. It includes two rolling mill direct current motors mounted on the same shaft and base. These motors will each have a continuous rating of 2,000 h.p., 600 volts, at 75 r.p.m. To furnish current to the mill motors, there will be a motor generator set consisting of two direct current generators each having a normal rating of 1,700 k.w., 600 volts, 375 r.p.m., and one 1,800 h.p. induction motor with flywheel mounted on the same shaft. The flywheel is to be used to absorb and deliver energy in such a way as to make power taken by the motor as uniform as possible. When the load rises above a certain value the resistance will automatically cut into the rotor circuit of the induction motor. This will increase the slip, and allow the set to slow down. The flywheel will thereby give up its stored energy in tending to keep the speed constant. When the load on the generator is again reduced the resistance will be automatically cut out of the rotor circuit of the induction motor, which will tend to speed up the set and restore energy to the flywheel .

Allis-Chalmers-Bullock, Limited, have also recently received an order for one single drum hoist engine, designed to raise a load of 3,000 pounds at the rate of 300 feet per minute. It will be driven by a 40 h.p. induction motor and is for installation in the Mond Nickel Company's plant at Victoria Mines. The company are paying particular attention to the manufacture of these complete electric hoists and are in good position to do so, since they are manufacturers of both hoisting engines and electrical apparatus.

The Lidgerwood Manufacturing Company, of New York, manufacturers of logging machinery, have decided to manufacture their machinery in Canada, and have completed arrangements with the Allis-Chalmers-Bullock, Limited, whereby a logging machinery department will be maintained at the Rockfield plant, of the latter company. This move on the part of the Lidgerwood Company was necessary to protect their Canadian patent rights, and they will also save considerably in duty on their goods. Mr. Asa Williams has been appointed manager of the new logging machinery department for Allis-Chalmers-Bullock, Limited.

Electrical Operation for Quebec Factories

Recent progress in electrical development in Quebec City includes the changes which the Dominion Corset Company and the Quebec Box Factory have under way. These companies are located in the same building and have decided to change over from steam power drive, in their different departments, to operation by electric power. A two phase, 220 volt alternating current system will be installed and a separate motor will be provided to operate each sewing machine in the corset factory. The drive from the motors to the shaft will be direct, and for the present seven Renold's chain drives, as supplied by Messrs. Jones & Glassco, of Montreal, will be installed; the balance consisting of ordinary leather belt drives.

The equipment for the plant will consist of one 75 k.w. generator and thirteen motors, all supplied by the Allis-Chalmers-Bullock, Limited. The layout of the plant was designed by Mr. J. D. Lachapelle, consulting electrical engineer, 316 Lagauchetiere street west, and installed by the Eastern Electrical Engineering Company. All the wiring will be placed in iron conduit.

Canadian Crocker-Wheeler Company

The annual meeting of the shareholders of the Canadian Crocker-Wheeler Company, Limited, was held at the head office, 41 Street Railway Chambers, on Thursday, Feb. 17th. The following directors were elected for the coming year: Dr. Schuyler Skaats Wheeler, Ampere, N.J.; Lt.-Col. F. W. Hibbard, K.C., Montreal; F. E. Lovell, C. H. Lovell, Coaticooke, Que.; J. B. Milliken, Ampere, N.J.; Edward Heitmann, Mont Claire, Va.; R. A. Stinson, Montreal.

At a subsequent meeting of the directors Mr. F. E. Lovell was elected president; Mr. R. A. Stinson, vice-president, and Mr. Edward Heitmann was chosen chief engineer.

Rapid progress has been made with the Crocker-Wheeler Company's Canadian plant at St. Catharines, and it is expected that a portion of it will be placed in operation within a few weeks.

Pennsylvania Water & Power Company

The reorganization of the McCall Ferry Company, of McCall Ferry, Pa., which went into liquidation some time ago, has been successfully arranged. The work of carrying on the development is being proceeded with, the new company being known as the Pennsylvania Water & Power Company. Mr. J. A. Aldred, president of the Shawinigan Water & Power Company, has been appointed president and general manager of the new company, and it is understood that Mr. H. S. Holt, president of the Montreal Light, Heat & Power Company, is also largely interested. As announced before, Mr. R. S. Kelsch has been retained as consulting engineer.

The construction of high voltage transmission lines to Baltimore, Md., is at present under way, and contracts for the steel towers required have been signed with Miller Bros., of Staten Island; while the Ohio Brass Company will supply the insulators. Mr. John A. Walls, formerly chief engineer of the Shawinigan Water & Power Company, has charge of very important work at McCall Ferry and of the transmission lines to Baltimore.

Notes from McGill University

Prof. L. A. Herdt and Mr. R. S. Kelsch were recently elected chairman and vice-chairman, respectively, of the electrical section of the Canadian Society of Civil Engineers. The meeting of this section called for Feb. 24th, has been postponed until early in March, when a paper by Prof. J. E. Dalemont on "Resonance in Transmission and Distributing Circuits" will be read and discussed.

The members of the McGill Electrical Club were addressed recently by Mr. Hyde, superintendent of sub-stations for the Montreal Light, Heat & Power Company, and subsequently visited the Central, Cote St. Paul and St. Henry sub-stations of the company. The different expeditions were in charge of Mr. Hyde, Prof. Herdt and other members of the McGill electrical staff.

Mr. Percy Cole, of the engineering staff of Allis-Chalmers-Bullock, Limited, at Rockfield, recently lectured to the fourth year electrical students on the design of 100,000 volts transformers.

Prof. Adam Short, late of Queen's University, delivered an interesting lecture on the relation of capital and labor, at McGill University on the 10th of February.

Current Topics

The Canadian Westinghouse Company, Limited, have been awarded the contract for the construction of two quadruple equipments to be used on steel dump cars which are being constructed by the Canada Car & Foundry Company for the Quebec Railway, Light, Heat & Power Company.

A new electric sign which has been erected by the Denis Advertising Signs, Limited, in front of their premises at 150 Craig street west, Montreal, has attracted considerable attention. The sign, a chromatic design, is operated by motor and special flasher equipment. Twelve different designs are shown in its operation, and an excellent kaleidoscopic effect is obtained.

Mr. J. J. Campbell, formerly connected with the sales department of the Montreal office of the Canadian Westinghouse Company, Limited, has joined the staff of Mr. H. D. Bayne, 11 St. Sacrament street, Montreal. Mr. Bayne expects to sail for Sweden early in March on a business trip in connection with the interests of the Swedish General Electric Co.

W. J. O'Leary & Company, 36 Recollect street, has been awarded the contract for the complete installation of electrical equipment in the new Canadian Pacific Railway elevator in course of erection at Victoria Harbor, Ont., and expect to commence operations about the middle of March.

Vancouver and Western Canada

Rapid Progress at Many Points—Vancouver City Engineer a Commendable Appointment—Nanaimo Closes Cheap Lighting Contract

Vancouver's New City Engineer

Mr. J. A. McCrossan, who on Jan. 1st last succeded Mr. R. L. McCullough as City Electrician of Vancouver, B.C., is well and favorably known to a majority of the citizens, having served the city in the same capacity in the early nineties. Not yet 45 years of age, Mr. McCrossan has had a large experience in the electrical field. He started his career as manager of a mining company, in which position he acquired a taste for electrical knowledge that prompted him, in 1891, to join the staff of the City Telephone & Electric Company at Rat Portage (now Kenora). He remained with the company for eleven years, his duties towards the close of his term being largely those of an expert. In 1894, Mr. McCrossan was invited to come to Vancouver and assume charge of the city work, a position which he filled with credit to himself and advantage to the corporation, until the fall of 1897, when he resigned to become manager of a dental supply business in which he held a financial interest.

When it became known last fall that the work of the then occupant of the position was proving unsatisfactory, Mr. McCrossan's name was again brought forward, with the result that he was re-engaged at an increased salary.

In 1893 Mr. McCrossan was admitted as associate member of the American Institute of Engineers, and in 1895 was advanced to full membership. Possessed of splendid administrative ability in addition to sound theoretical knowledge, and eminently fair in his dealings with citizens and employees, Mr. McCrossan's reappointment is generally commended.

Coast and Mountain Electric Flashes

City Engineer McCrossan has reported adversely on the proposal made by several of the city aldermen that the steam plant at the city incinerator be used to generate electric current for the lighting of the city hall offices. Only about 25 h.p. is available, and this supply is not constant. The lighting of the incinerator building is the best that can be accomplished.

With the advent of 1910 a new office was created by the B. C. Telephone Company management, that of general superintendent of plant. The occupant of the responsible position is Mr. C. F. Bollschwerler, late manager of the Pacific Telephone Company's plant at Los Angeles, Cal.

The citizens of Prince Rupert intend erecting on the waterfront a suitable plant, to be operated by the corporation of the city of Prince Rupert, and are now negotiating with several electrical engineers, with the view to getting an expert opinion as to the requirements.

"The Pelton Wheel" was the subject of a lecture given recently under the auspices of the National Light Association of the B.C.E.R. in the lecture room at the company's barns, Vancouver, by Mr. George Henry, jr. As the lecturer is one of the foremost hydraulic engineers in the United States, and chief designer for the Pelton Water Wheel Company, of San Francisco and New York, a very interesting explanation was given of the construction, mechanism, various types of nozzles, how the motion of water imparts power to the buckets and is in turn imparted to the wheel. By means of diagrams, Mr. Henry showed in detail the various parts, and elucidated various theories regarding water pressure, etc.

S. H. Hancox, chief electrician of the Queensland Government, was in the city recently on his way to San Francisco. While here, Mr. Hancox expressed the opinion that if the city wished to secure the best results in street lighting the clear glass globes in use should be replaced by frosted ones.

Mather, Yuill & Company, electrical engineers and contractors, Vancouver, recently installed the following additions to the corporation electrical plant at Ladysmith, Vancouver Island: one 115 k.w., 3 phase, 60 cycle, 2,200 volt alternator (Westinghouse), direct coupled to 12x18x14 Robb-Armstrong tandem engine. Power is supplied by a 72x18 foot Goldie & McCullough boiler, with 90 foot stack. The distributing system is complete, and the test proved very successful.

The municipally-owned electric lighting system of Kamloops, B.C., has been strengthened by the addition of a 200 k.w., 3 phase, 60 cycle, 2,200 volt Westinghouse alternator, direct coupled to a 15x26x16 Robb-Armstrong tandem engine; one 120 k.w. belted Westinghouse alternator; the whole being controlled by a new four panel switchboard, comprising a complete modern station equipment.

Messrs. Rankin & Cherrill, electricians, 547 Westminster avenue, Vancouver, recently completed several important contracts. In the new Strathcona Hotel, Hastings street, they installed a Holtzer-Cabot intercommunicating telephone system with a 75 point switchboard; in the new Carlton Hotel, Cordova street, a similar system; and a 600 light installation in the new car barns of the British Columbia Electric Railway on 15th avenue.

The Hinton Electric Company have installed a 6 k.w. direct connected lighting set on the fishing steamer "Kingsway," on which has also been installed a wireless telegraph equipment.

The Adams River Lumber Company have installed a 75 k.w. alternating current generator to light their mill and the town of Chase, B.C. The installation was made by the Hinton Electric Company, of Vancouver.

The British Columbia Telephone Company is about to undertake a costly system of extensions in Mount Pleasant and Fairview residential districts. Wherever lanes are in existence no poles will be placed on the streets. On Granville street and other main thoroughfares the tall wooden poles have been removed to the lanes in the rear.

The city of Nanaimo, Vancouver Island, has entered into a contract with the Nanaimo Electric Light Company, to extend over five years, dating from Jan. 1, 1910, whereby the annual cost of arc lamps for street lighting has been reduced from $113 to $70 per year, and the incandescent street lights of 32 c.p. have been placed at $16 per year. Average cost per year for the past eight years, $5,193.93; for 1909, $4,012.72; average cost per light per year, for the past eight years, $103.87; for 1909, $67.32.

Manager D. J. McQuarrie of the New Westminster branch of the British Columbia Electric Railway, has received instructions to build during 1910 at the company's New Westminster shops, 100 freight cars, 40 passenger cars, 6 interurban passenger cars, and two electric shunters. The estimated cost is $450,000.

City Electrician Bowler, of Victoria, reported recently that the reduction in the price of electric current of two cents per kilowatt hour, ordered by council, had lessened the income of his department by $8,000 or $10,000. The loss, however, had been offset by new customers, over 300 buildings having been connected with the city's wires during the year.

The Shuswap Falls Light & Power Company are negotiating with the council of Armstrong, B.C., for the purchase of the town's electric light plant. They claim the Shuswap plant will be capable of supplying power for the whole valley from Penticton to Sicamous. Another scheme of the company is to connect Enderby, Armstrong and Vernon with Grand Prairie and Salmon River by means of a tram line.

The Power, Light & Telephone Company of Creston, B.C., accomplished some good work during 1909. The company was incorporated in 1907, and now controls 100 miles of local and 24 miles of long distance lines. A considerable sum was expended on new equipment.

The Fort George Lumber & Navigation Company will install a system of electric lighting and water supply on South Fort George (B.C.) townsite during the coming spring.

Forty men are at work on the construction of the new sub-station and passenger and freight barns of the B. C. Electric Railway at Chilliwack.

The firm name of Mather & Yuill, dealers in electrical supplies, gasoline engines, etc., Vancouver, B.C., has been changed to Mather, Yuill & Company, Mr. A. L. Palmer having been admitted to a partnership.

Eighteen carloads of boiler machinery for the new steam auxiliary plant of the British Columbia Electric Railway, to be erected at the False Creek end of Barnard street, Vancouver, have been unloaded at the site, and the huge 4,000 h.p. turbine engine which the Allis-Chalmers-Bullock Company will install in the plant is also on the ground. The 250 foot chimney of the plant will be built of reinforced concrete.

The Street Railway Company of Nelson, B.C., has matters well in hand for the initiation of a service in the early spring. A contract has been let to the Allis-Chalmers Company, of Montreal, for a motor generator set of 250 kilowatt capacity. Two cars have been ordered from the Ottawa Car Company, each equipped with four 40 h.p. Allis-Chalmers motors, and each seating 40 passengers. A sub-station and a car barn in accordance with the requirements of the system are now under construction, and will be ready for service at the time specified in the contract.

Large contracts have been awarded to the Canadian General Electric Company for electrical machinery for use in the Jordan River, Vancouver Island, plant of the B. C. Electric Railway Company, and also for the plant of the Western Canada Power Company on Stave River, about 30 miles east of Vancouver city. In the first instance, the approximate value of the contract will be $30,000, while in the latter it will reach $150,000. For the Jordan River plant the machinery will include step-up and step-down transformers, switchboards, lightning arresters, etc., including two-thirds of the electrical portion of the machinery. On Stave River the company will install for the Western Power Company two generators of 16,000 kilowatt normal capacity, and a 36,000 kilowatt transformer, and under full operation 30,000 h.p. will be produced. The Escher-Wyss Company, of Switzerland, will supply the waterwheels for the Stave River plant, and the Thomas Insulator Company, the high tension insulators. The contracts for the switchboards and the steel towers and poles have not yet been awarded.

On condition that Vancouver city council do not allow any other company to plant poles on Granville, Hastings street and Westminster avenue, the B. C. Electric Railway Company has promised to remove from these thoroughfares the forest of poles that has been an eyesore for years. The company has also expressed its willingness to take its poles off all residential streets where the owners would consent to allow the trolley support wires to be fastened to their buildings. These changes will make a vast improvement in the appearance of the thoroughfares.

On the night of Feb. 9th Vancouver's power and light supply failed for about a quarter of an hour. "Broken wire!" was the laconic explanation on everybody's lips, and not until next morning was the true reason disclosed. At Barnet tower, nine miles east of the city, where the current from Lake Buntzen generating plant is transmitted to the city, the breaking of a transmission wire resulted in 30,000 volts of electricity passing through the body of a workman named Leo Weaver, killing him instantly. Two companions were badly injured by the same discharge, but will recover.

The electric pumping machinery recently installed in connection with Victoria's new high pressure salt water fire protection system has so far failed to generate the pressure guaranteed by the makers, the D'Oliver Engineering Works, of Philadelphia. Alterations are being made, and the plant will not be in shape before May.

At a recent meeting of the fire and police committee of the council of Vancouver, B.C., City Electrician McCrossan made the surprising statement that, in his opinion, not more than a third of the electrical installations of the city were put in under inspection, the reason being that his department had not enough inspectors to do the work. This state of affairs struck the committee as being calculated to place a premium upon conflagrations, and it was at once decided to engage another assistant inspector.

Postponed Meeting A.I.E.E.

The February meeting of the Toronto section of the American Institute of Electrical Engineers has been postponed owing to the unavoidable absence of Mr. Jens Orten-Boving, the British electrical engineer who has consented to address this meeting. It is expected that Mr. Orten-Boving will arrive in Canada early in the month and that the Institute will meet about March the twelfth.

Personal Mention

J. D. Whitmore, formerly the city engineer of Moose Jaw, has opened up a consulting engineer's office in the Mickleborough Block, Regina, and will make Regina his permanent residence.

A. S. Balsden has resigned the managership of the St. Thomas Street Railway system, a position he had held for some five years.

J. S. Jost, manager of the B. C. Telephone Company at Grand Forks, has been transferred to Nanaimo. Mr. A. Legault, of Greenwood, will replace Mr. Jost in Grand Forks.

George F. Evans, formerly general manager of the Canadian Westinghouse Company, is dead.

R. S. Kelsch has been appointed consulting electrical engineer for the Ottawa Railway, Light, Heat & Power Co.

C. W. Jarvis, Fort William, is chairman of the joint board that operates the street railway owned by Port Arthur and Fort William.

Howard Murray has been elected a director of the Shawinigan Light & Power Company.

Prof. R. W. Angus lectured recently in Ingersoll on the subject of Niagara power development plants.

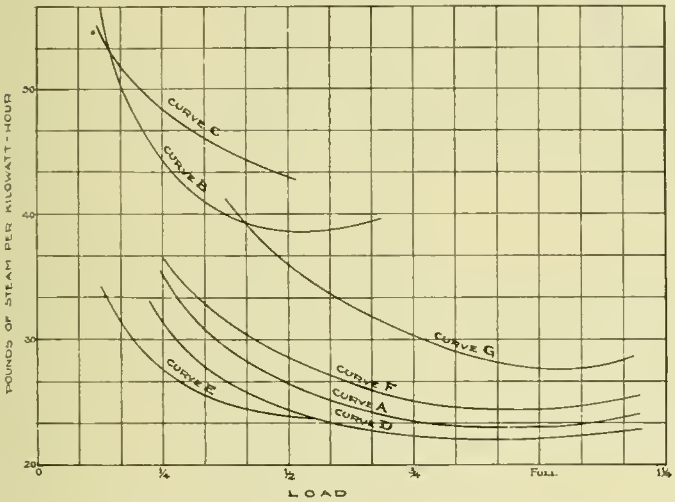
H. A. Wilson, the recently appointed Macdonald Professor of Physics in McGill University, lectured recently before the Canadian Institute on "Certain Theories Held Concerning the Ether."

W. C. Furness, for 40 years manager, first of the old Montreal Telegraph Company, and latterly of the G. N. W. Telegraph Company in London, Ont., is dead.

T. Nicholson, until recently connected with the Hinton Electric Company, of Victoria, B.C., has been appointed city electrician of Ladysmith.

Current Literature

Mixed Pressure Turbine and Engine Plants—H. Y. Haden. The purpose of the article is to show the possibilities of the independent mixed pressure turbine combined with the reciprocating engine as an economical power producer in manufacturing plants of moderate size where considerable electricity is required, due to a variable power factor, and where from time to time supplies of low pressure exhaust steam are desired for manufacturing purposes. The mixed-pressure turbine is described as a further development of the low pressure turbine, the essential difference between the two types being that the mixed-pressure turbine is an entirely independent machine operated by its own governors but at the same time is capable of utilizing all the available exhaust steam from the engines operating in connection. In this type of turbines, using steam nozzles, the wheel case is so arranged as to allow the use of two complete sets of nozzles, each set designed to allow of the proper number of expansions for the most economical operation at its particular steam pressure. In this way we have a combination turbine that will take high or low pressure steam, or both, depending on the amount of exhaust steam available, the changes in the conditions of operation being brought about automatically.



Curves Showing Combined Performance of Simple Steam Engine and Low Pressure Turbine.

The accompanying figure represents by different curves the performance of a combined 250 k.w. simple Corliss engine or a four-valve engine with a 200 k.w. turbine unit. Curve A shows the steam consumption, per k.w. at the switchboard, that would be obtained from a high class Corliss engine having a capacity of 450 k.w. at the best point. Curve B shows the performance of a four-valve 250 k.w. engine operating non-condensing and exhausting to a back pressure of a pound above atmosphere. Curve C shows the guaranteed economies of a low pressure 200 k.w. turbine taking steam at one pound pressure above atmosphere and exhausting to a final pressure of 1½ pounds absolute. Curve D shows the combined results of the simple engine and the low pressure turbine where all the exhaust steam, less that lost from condensation, is available for the turbine unit and where it is not necessary to introduce any live steam to the turbine. Curve E shows a performance curve of the turbine unit operating entirely with high pressure steam and condensing to 1½ pounds absolute. Curve F shows the performance of the combined units where 2,000 pounds per hour of exhaust steam at one pound above atmosphere pressure is withdrawn for heating purposes, this loss being made good with an equal amount of high pressure steam. Curve G shows the resultant inherent economy of the compound condensing engine if 2,000 pounds per hour of low pressure steam be taken either from a low pressure boiler or through a reducing valve from a high pressure boiler—this steam being charged against the economy of the engine. —Power and the Engineer.

Recent Trade Publications

Electrical Books—A catalogue of books published by the McGraw-Hill Book Company, New York, covering electricity, apparatus, design, lighting, wiring, electric railways, telephony, telegraphy, power transmission, steam, gas and water power.

The A. B. Regenerative Flame Arc Lamp—A catalogue issued by the Adams-Bagnall Company, of Cleveland, Ohio, giving a general description of their lamp, its uses, advantages and efficiency. Well illustrated and contains much information on the subject of arc lighting.

Elevator Controllers—A booklet describing the Cutler-Hammer line of controlling devices designed for use with alternating and direct current motors operating passenger or freight elevators; compiled by the Cutler-Hammer Manufacturing Company, Milwaukee, Wisconsin.

Despatchers' Signals for Electric Interurban Railroads—Distributed by the Stromberg-Carlson Telephone Manufacturing Company of Rochester, N.Y., outlining the value of a despatcher's signal, giving a general description, with sketches, of the apparatus, and explaining the line, battery and equipment requirements.

The Simplex Coal Cutting Machine—A descriptive illustrated booklet, issued by the Electric Construction Company. Limited, of Wolverhampton, explaining the various points of excellence of their electric bar coal cutting machine for use in mines. A short description of their full line of manufactured articles is appended, including generators, motors, switchboards, controllers, etc.

Peebles' Works and Manufactures—Booklet No. 706, issued by Bruce, Peebles & Company, Limited, engineers, Edinburgh. The first part describes very clearly, with illustrations, the site, offices and works of the old established firm. The second part deals with some of the firm's manufacturing specialties, including motors, dynamos, alternators and controllers of all kinds.

Westinghouse Lightning Protection Apparatus—Circular No. 1132 by the Canadian Westinghouse Company, Limited, Hamilton, Ont., descriptive of the various types of lightning arresters manufactured by this company, and calling special attention to their type A electrolyte lightning arrester for alternating current systems from 2,200 to 120,000 volts. An immense amount of information is clearly set forth in small space.

Multiple Switchboards—Bulletin No. 53 issued by the Kellogg Switchboard & Supply Company, Chicago. A number of pieces of the Kellogg company's standard apparatus are described, with their method of installation and a fine diagram illustrates the lay-out of a typical system. Much useful information is given that would assist the average purchaser, among which is a diagram sketch of a model exchange.

Progressive Fernie—A descriptive booklet published by the Fernie "District-Ledger" and which reflects the greatest credit on the publishers. It represents the phenomenal growth to Fernie since the fire of Aug. 1st, 1908, up to the present moment, and describes how during that short space of time on the publishers. It represents the phenomenal growth in Fernie has recovered and rebuilt with such incredible rapidity that it has practically regained its former size and importance.

Inter-communicating Telephones—For residences, offices, factories, banks, hospitals and public buildings. A booklet issued by the Stromberg-Carlson Telephone Manufacturing Company, Rochester. A detailed description is given of the apparatus and its method of installation .

Current News and Notes

Armstrong, B.C.

The Shuswap Falls Light & Power Company is negotiating for the purchase of the local electric light plant. The construction of an electric railway connecting Enderby, Armstrong and Vernon with Grand Prairie and Salmon River is under consideration by the company.

Blind River, Ont.

Preparations are being made by the Blind River Light, Heat & Power Company, for extensive improvements and additions to its system during 1910, which will include the construction of a new concrete power house and installation of an additional 300 h.p. turbine. Thomas H. Pindell is superintendent.

Brandon, Man.

Two car loads of machinery have arrived, to be followed by others, for the extension of the Brandon Electric Light Company's plant.

E. J. Gifford is asking for franchises to operate a heating plant, an electric light plant and a street railway system in this city. He will guarantee to have cars running in 1911 and to supply electric light 20 per cent. cheaper than at present.

Calgary, Alta.

The Alberta Provincial Telephone System has reached Cheadle, 20 miles east of Calgary, and is rapidly extending to Gleichen. Many farmers in the Bow river valley have applied for telephone service.

Smith, Kerry & Chace, Confederation Life Building, Toronto, are calling for tenders for two 4,000 k. v. a. generator units with 6,000 horse power turbines for switching equipment and transformers for the generating station and for the terminal station this city. These will include three 2,000 k. v. a. transformers at present, although prices are being asked on six, which will be the total equipment. At the generating end the transformers will be 55,000 volts and 50,000 at the terminal station.

Chatham, Ont.

It is stated that preparations are being made by the Chatham Gas Company to furnish electricity to operate the system of the Chatham, Wallaceburg & Lake Erie Railway Company. The gas company will install a 250 kw. motor generator set, to be used in connection with a 275 kw. alternator. P. S. Coate is secretary and manager.

Clayburn, B.C.

Plans are out by the Clayburn Brick Company to operate its machinery by electricity. Orders have been placed with the Allis-Chalmers-Bullock Company for one 200 h.p. motor, four 40 h.p., one 20 h.p. and two 10 h.p. motors.

Cranbrook, B.C.

The Bull River Electric Power Company, who are building a development plant on the Bull river, has already spent in the neighborhood of $200,000 on construction work. The flume, a mile and three-quarters long, sixteen feet wide and seven and a half feet deep, is nearly complete. The plant will be about 20 miles from Cranbrook and 15 miles from Fernie, and so is located advantageously for power distribution throughout the Crow's Nest section. 16,000 h.p. will probably be available some time during 1910.

The proposed hydro electric development at Cranbrook provides for the construction of a dam not exceeding 60 feet in height and the right to store water on, respectively, St. Mary's river and St. Mary's lake, east Kootenay district, as well as to construct storage reservoirs at the head waters of the St. Mary's lake. An auxiliary steam plant is already nearing completion and will have a capacity of about 600 h.p.

Chilliwack, B.C.

The Fraser River Lumber Company is applying for power to utilize 1,600 cubic feet of water per second on the Coquihalla river at a point six miles above the town of Hope, for the purpose of generating electricity for light, heat and power. The North Coast Lumber Company is applying for water rights for similar purposes, on Silver Creek, in the same locality, to the amount of 1,000 cubic feet per second. A. D. McRae, Fraser Mills, B.C., is president of both companies.

Negotiations which have been carried on for some months between the Chilliwack Telephone Company and the British Columbia Telephone Company have finally resulted in an agreement whereby the British Columbia Telephone Company withdraws from Chilliwack and at the same time allows the Chilliwack subscribers the use of their long distance service.

Dawson City, Yukon.

It is reported that preparations are being made for the construction of a power ditch near the north fork of the Klondike river in the spring. The water is to be carried eight miles to a point on the main river, where it will have a fall of 30 feet, and will be utilized to generate electricity, which will be transmitted to points along the Hunker or over the divide. A. N. C. Treagold is interested in the enterprise.

Edmonton, Alta.

The city of Edmonton is reported to have engaged Walter J. Francis, of Montreal, Que., consulting engineer, to make a report on the power plant and other civic utilities.

The Edmonton Radial Railway Company, it is stated, expects to place contracts during the next six weeks for the construction of about three miles of single track and one mile of double track. Chas. E. Taylor, general manager.

The Edmonton Engineering Society, B. F. Mitchell secretary, announces that "The Edmonton Engineering Society is open to receive catalogues, etc., from manufacturers."

Tenders are being called by the Department of Public Works for the supply of whole or any part of the required estimate of material for telephone construction. List of material, etc., on application to the Superintendent of Telephone office, Department of Public Works, Edmonton. John Stocks, Deputy Minister.

Fredericton, N.B.

A company to be known as the Fredericton Street Railway Company will make application to the Legislature for a charter. Solicitor, R. B. Hanson.

Fort Frances, Ont.

The Ontario Government refuses to grant the Ontario & Minnesota Power Company the privilege of exporting power to the United States. The plant is situated on the Rainy River on the Canadian side, at Fort Frances. A development company called the Minnesota & Ontario Power Company operates on the other side of the river in the town of International Falls, both plants developing power at the same point, Albertan Falls. The two plants are controlled by the same interests. The town of Fort Frances has placed its case in the hands of the Hydro-Electric Power Commission.

The rates for electric lighing have been fixed as follows: 10 to 100 kilowatt hours a month to be charged at 10 cents per k.w. hour, with 20 per cent. discount for prompt payment; 100 kilowatts and over the same rate with 25 per cent. discount. Minimum charge $1 per month—no meter rent.

Fort William, Ont.

An electric sign for the new Victoria Hotel is being equipped by Em. Etienne, 117 Myles street, and will contain 216 incandescent lamps.

A movement is on foot to have a special mail car operate on the electric line between Fort William and Port Arthur.

The last Bell telephone has been removed from commission in this city, and it is proposed to raise the rates for both private and business telephones. In the past the system has been operated at a financial loss to the city.

Rapid progress is being made by the Kakabaka Falls & Mount McKay Electric Railway Company on the construction of its rural lines. It is expected to have the railway to Kakabeka Falls, 18 miles distant, finished during the coming summer. As soon as warranted the railway will be extended so as to form a belt line.

The Allis-Chalmers-Bullock Company has completed the installation of a 1,000 h.p. motor generating set in the power station of the Kaministiquia Power Company at Fort William to supply electricity for the street railway between Port Arthur and Fort William, which is owned jointly by the two cities. Four new cars have been received and eight more have been ordered. Double tracking of the system throughout will be completed during the coming summer. N. C. Pilcher is general manager of the street railway.

Guelph, Ont.

The contract for the equipment of the hydro-electric transformer station has been awarded to the Canadian General Electric Company.

Galt, Ont.

The Galt Gaslight Company, which also supplies electric light to this town, value their complete plant at $85,000. The fire and light committee considers this valuation too large and recommends that $12,500 be offered the company for their poles and wires only.

Glencoe, Ont.

A new electric lighting system has been installed in Glencoe, and a by-law will be submitted to the electors on March 4 providing for the appointment of an electric light commission to be composed of Robert F Howard and James N. Currie.

Halifax, N.S.

At the annual meeting of the Nova Scotia Telephone Company, held on Monday afternoon at four o'clock, the following directors were re-elected; H. C. Borden, Dr. C. F. Fraser, J. C. Mackintosh, J. Y. Payzant, B. F. Pearson and Wm. Rob

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ertson. The statement for the year showed a satisfactory state of affairs, and several of the shareholders present expressed great pleasure with reports presented. At a subsequent meeting of the directors Dr. C. F. Fraser was re-elected president and J. Y. Payzant, vice-president.

Hamilton, Ont.

The Hamilton Street Railway Company's receipts for 1909 were $339,108, an increase over 1908 of $26,382. The city's share was $34,648.

Hespeler, Ont.

Plans are being considered to take electrical service from Niagara Falls, through the Hydro-Electric Power Commission, about May 1. It is proposed to install a synchronous motor to replace the present steam plant, which will be held as an auxiliary. When the change is made a power service will be established. W. Brewster is treasurer.

Ingersoll, Ont.

In pursuance of the agreement between the two parties to submit to three arbitrators the valuation of the Ingersoll Electric Power & Light Company's property, the town has appointed Robert A. Ross, of Montreal, and the company, E. J. Philips, of Berlin. Under the agreement these two appoint a third arbitrator.

Kenora, Ont.

The Hudson's Bay Company was awarded $45,000 and the Keewatin Power Company $35,000 for property expropriated by the town of Kenora. The board of arbitrators consisted of His Honor Judge Winchester, Mr. W. T. White, for the Hudson's Bay Company, Mr. Henry Holgate for the town of Kenora, and Mr. W. T. Tye for the Keewatin Milling Company.

Ladysmith, B.C.

The Ladysmith city council has endorsed Vancouver's request to the Provincial Government for the establishment of a system of publicly owned telephones.

London, Ont.

Now that the charter to the London & Lake Erie Railway & Transportation Company (the old South Western Traction) has been granted, construction work on the line from Brantford to London will be commenced this spring. It is the intention of the company to construct the section from Paris to Woodstock and also from Paris to St. George in the near future.

Latchford, Ont.

In connection with the concrete dam to be constructed here, it is stated that as the work progresses a power plant is to be installed and electrical energy generated.

Medicine Hat, Alta.

Arrangements are being made by the Alberta Clay Products Company for the installation of a 500 h.p. power plant, the equipment of which will include three tubular boilers, Corliss engine, generator, pumps, heater, etc.

Moncton, N.B.

The Moncton Electric Street Railway Company has submitted an offer to the city council to lease the electric lighting plant and the gas plant, which are operated at present by the municipality. The company offers to pay to the city 3 per cent. of gross earnings for the first five years, 4 per cent. for the next five years, and 5 per cent. for the remainder of the franchise period; also, natural gas wells, 10 miles out of the city, are to be developed and the present price of gas reduced to one half.

Moose Jaw, Sask.

The city council has received an offer from a reliable source dealing with the establishment of a street railway system in

A new 250 h.p. boiler is being installed, which now brings the boiler capacity up to about 750 h.p.

Melbourne.

The annual statement of the Ekfrid-Caradoc Telephone Company shows the total number of subscribers at 255, total length of pole line 110 miles. Fifty miles line will be added in the immediate future in developing neighboring townships and a trunk line will also be built joining Glencoe and Strathroy. A dividend at the rate of 6 per cent. was declared and the price of shares raised to 25 per cent. premium.

Montreal, Que.

The city of Maisonneuve has entered suit against the Royal Electric Company and the Montreal, Light, Heat & Power Company for annulment of its lighting contract on the ground that the service is not according to agreement, inasmuch as the arc lamps rated at 2,000 c.p. are much below that standard.

The gross earnings of the Shawinigan Water & Power Company for 1909 amounted to $819,171, an increase over the previous year of nearly $113,000. Net profits were $322,867, an increase of $53,000. There is persistent rumor of an amalgamation with the Montreal Light, Heat & Power Company.

The claim of the Montreal Light, Heat & Power Company that the Dominion Light, Heat & Power Company has no right to erect poles within the limits of the municipality of Maisonneuve has been upheld by Mr. Justice Davidson.

The Montreal Light, Heat & Power Company, continuing its policy of burying its wires in conduits throughout the city, have decided to lay 60,000 feet of conduits between Mentana and Marie Ann streets, and between Orleans and Forsyth streets.

New Westminster, B.C.

The Couteau Power Company has recently made an application in Victoria for a franchise to build an electric railway.

New Liskeard, Ont.

The Nipissing Central Railway Company is developing power at High Falls, a point on the south branch of the Wabigoon river, for which purpose two dams have been erected, one at High Falls, the other above that point.

North Toronto, Ont.

The Holmes Electric Company has a contract with the town of North Toronto for the installation and maintenance of a fire alarm system.

Nelson, B.C.

The street railway project is so far advanced that the issue of 25,000 5 per cent. debentures is being authorized by the shareholders. A contract has been let to the Allis-Chalmbers-Bullock Company for a motor generator set of 250 kw. capacity and for two cars, each equipped with 10 h.p. A-C-B motors, to the Ottawa Car Company.

Nanaimo, B.C.

The cost of street lighting for the year 1909 was $4,012. The contract under which light is supplied to tho town by the Electric Light Company places the annual cost of arc lamps at $70 and of 32 c.p. incandescents at $16.

The city council has endorsed the same resolution was was recently passed by the city of Vancouver asking "the Provincial Government to take into early consideration the acquiring of all telephone systems in the province and operation of the same in the public interest."

Niagara Falls, Ont.

It is likely that the electric railway line from Queenstown to Niagara-on-the-Lake will be extended. Superintendent Martin Sheehan of the Intercolonial Railway and Mayor James Aikens are interested.

Orillia, Ont.

A mass meeting of Orillia ratepayers endorsed the town council's support of the Monarch Railway Company's application to the Legislature for a charter on condition that all reference to the use of the streets of Orillia be omitted.

Ottawa, Ont.

The Ottawa & Montreal Power Transmission Company, which is seeking powers to acquire and develop electric power in the vicinity of Ottawa and build a transmission line to Montreal, is apparently backed by the same interests as control the Ottawa & Hull Power Company.

Mr. Lewis' bill requiring wireless telegraph equipment on all coasting and seafaring vessels of 1,200 tons and upward has been thrown out as being premature.

Application is to be made for the incorporation of a company to construct the Ottawa, Rideau Valley & Brockville Railway, to run from this city to Brockville, about 70 miles distant. From Ottawa also a branch line will be run up to High Falls in Wright county.

The Ottawa Electric Railway Company's net earnings for 1909 were $197,854, or at the rate of 15 3-4 per cent. on the paid-up common stock, as compared with 14 per cent. in 1908, 18.10 per cent. in 1907, and 18 per cent. in 1906. These earnings contribute a record for Canadian tractions.

The bill to incorporate the Toronto Central Terminal Company has been defeated by the Commons Railway Committee.

Plans are being discussed for the extension of the Ottawa Electric Railway system to supply Ottawa South and Ottawa East with car service.

The Western Canada Power Company's bill asking for enlarged powers to construct railways, telegraph and telephone lines has been approved by the railway committee.

Five or six years ago, it is stated, Hon. Mr. Domville secured a charter for the Northern Commercial Telegraph Company, Limited, which charter enables the company to run telegraph and telephone lines from and to Quebec, Montreal, Ottawa, Toronto, Niagara Falls, Hamilton, Detroit and a section between Emerson and Winnipeg, and also from Quebec and Montreal to the Maritime Provinces. The capital is £750,000 (sterling), and a company has been organized and it is now stated that tho contract for one thousand miles of the work has been given to M. Connolly, tho well-known contractor. Roeblings, the great copper wire manufacturers, are said to be practically the company.

Preston, Ont.

Tho bylaw to raise $18,000 for the installment of the hydro-electric plant was carried by a large majority.

Port Arthur, Ont.

The city of Port Arthur has closed a contract with the Hydro-Electric Power Commission for from 5,000 to 10,000 h.p. The power is to be supplied from the plant of the Kaministiquia Power Company at Kakabeka Falls. Work will commence at

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TORONTO **WINNIPEG**

once on the construction of the transmission lines and substation. W. L. Bird, of Fort William, Ont., is secretary and manager of the Kaministiquia Power Company.

Peterborough, Ont.

The Bell Telephone Company has absorbed the North American Telephone & Telegraph Company, a local concern operating in the district between Peterborough and Smith's Falls.

Quebec, Que.

Alderman Cannon will move, in council, to apply to the Legislature for power to force the electric light, telephone and telegraph companies to remove all poles from the streets of Quebec and lay their wires underground.

The Quebec Railway, Light, Heat & Power Company has placed a contract with the Ottawa Car Company for 15 pay-as-you-enter cars.

Renfrew, Ont.

A bylaw to raise $77,000 for the erection and development of a municipal power plant will be submitted to the ratepayers in the near future.

Sherbrooke, Que.

We have been informed that the St. Georges Electric Company, of this city, will build a new concrete dam and electric plant on the Chaudiere river. Probable expenditure, $75,000. J. W. Gregoire, secretary-treasurer.

St. Catharines, Ont.

The Lincoln Electric Light Company is exhibiting a new 60 c.p. series tungsten incandescent lamp, for which the company quotes a yearly rate of $20.

The Niagara District Telephone Company will make an effort this year to extend its lines to St. Catharines and Wellandport, and to connect with the Erie Company.

At the last meeting of the directors of the Dunnville, Wellandport & Beamsville Electric Railway it was decided that connection with St. Catharines must be a part of the programme.

The annual meeting of the Niagara District Telephone Company, held recently, disclosed the fact that there are now 350 subscribers and that prospects are bright for further extensions.

Sydney, C.B.I.

The Dominion Railway & Plaster Company, who purpose building an electric railway between Gypsum Quarries and Sydney, are seeking permission to enter and lay tracks on certain streets of the latter city.

Shelbourne, N.S.

A new municipal electric light plant with a capacity of 3,000 lights has been installed at a cost of about $23,000 and is giving complete satisfaction.

Stratford, Ont.

It is believed the transformer station in this city will be ready quite as soon as the current can be delivered by the commission.

Stonewall, Man.

The town of Stonewall, population 1,200, is negotiating with the city of Winnipeg for a supply of power and light from the new municipal installation.

St. Thomas, Ont.

City Engineer Bell is in receipt of specifications from the Hydro-Electric Commission for additions to the city's storage battery and the installation of a booster in connection with the coming of Niagara power. The battery will be increased from 264 to 280 cells.

The St. Thomas council is taking steps to have the law so changed that the present City Railway Commission will be abolished and the management of the street railway placed in the hands of the city council.

St. John, N.B.

Included in the estimate of expenditures on account of the light department for 1910 is an item of $23,500 for 314 arc lamps at $75.

Arrangements have been completed by which the New Brunswick Telephone Company will extend its long distance system so as to connect the greater part of the Gaspe peninsula area with St. John city. The company's line will cross the Restigouche river in the neighborhood of Metapedia, and is expected to connect with New Carlisle and Pasbebiac on Chaleurs Bay within a month. This means an extension of about 75 miles to the existing lines.

The committee appointed by the St. John Board of Trade to investigate the matter of increased telephone rates in this city by the New Brunswick Telephone Company, finds ''that the company's defence in no way justifies the increase in rentals,'' and recommends ''that steps be taken to instal a municipal telephone system in the city.'' The whole province is agitated over the recent increase in rates.

The St. John Railway Company are planning to construct a new building, which with the use of the old power house for a repair shop will add to their present equipment considerably.

Trenton, Ont.

The Trenton town council are asking authority to make certain expropriations that will admit of the extension of their water and electric light systems.

Toronto, Ont.

The city council will hereafter impose a license fee on all electric signs, the minimum fee to be $5 per year, which increases with the size of the sign. Each owner will also be required to assume all responsibility in case of accident from his sign.

A bill has been introduced in the Ontario Legislature requiring that all the telephone systems in the province be placed under the control of the Railway and Municipal Board.

Vancouver, B.C.

The British Columbia Telephone Company has commenced work on an extension of their line along the north shore of the Fraser river from Mission to Agassiz.

The private bill of the Vancouver-Westminster Terminal Railway & Dock Company, Limited, is now before the Legislature. It is proposed to build a line of railway from False Creek to Point Grey and to New Westminster with branch lines, and power is also sought to own and operate water powers for railway purposes only.

The Board of Trade has passed a resolution expressing its disapproval of a second telephone system in the city, and approving Government ownership and operation of telephones throughout the province.

City Electrician McCrossan will rigidly adhere to the regulation requiring a permit to be taken out for all electrical work and has notified electricians of the city that prosecutions will follow failure to comply. Iron conduit installations are being required in the more congested sections.

Application has been made by the Manquam Falls Power Company for rights to divert 1,200 cubic feet of water per second from the Manquam river, about 200 feet above the falls, for the purpose of generating electricity.

A bill has passed the Legislative Assembly providing for the inspection of tramways and reads as follows: ''The Lieutenant-Governor in Council may appoint and authorize any proper person or persons, whose duty it shall be from time to time, to inspect all tramways constructed, in course of construction, or that may hereafter be constructed.''

Victoria, B.C.

The Pacific Radio Company has purchased a site for a wireless telephone station on Smith's Hill. It is proposed to instal towers in all the leading cities along the coast from British Columbia south to Southern California.

The city's appeal against the right of the B. C. Electric Railway Company to carry freight on certain streets of the city of Victoria was dismissed by Mr. Justice Martin.

A bill for the incorporation of the Campbell river Power Company is now before the Local House. It is estimated that at least 30,000 h.p. can be developed at Campbell River Falls. Campbell River is situated in the northern part of Vancouver Island.

Wetaskiwin, Alta.

A by-law will be submitted to the electors on March 8 asking permission to borrow $5,000 for extensions and improvements to the electric light and power plant.

Winchester, Ont.

The present street lamps are being replaced by 60-watt tungsten lamps. Thomas O. Van Bridger, local manager.

Waterloo, Ont.

The Ontario Municipal & Railway Board, in the matter of the apportioning of the Berlin & Waterloo Street Railway receipts, has decided that Waterloo shall get 25 per cent. of the net earnings.

Winnipeg, Man.

The C. P. R. Telegraph Company has completed its new line between Winnipeg and Edmonton, to be used exclusively for the use of these two centres.

The speech from the throne delivered by Lieutenant-Governor Sir D. McMillan at the opening of the Manitoba Legislature made mention of the fact that the provincial telephone system has shown a most satisfactory year of operation and a largely increased net revenue.

By Mr. Justice Mather's recent decision it is held that the Railway Company is within its rights in generating power outside the city limits for street railway purposes. Such current cannot, however, be used to supply the city with power or light.

The Winnipeg Electric Railway Company will enlarge its auxiliary steam plant by about 3,000 horse-power. A contract has been awarded to Babcock & Wilson, of Montreal, for new boilers, to cost $35,000.

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A 26 Ton Reel of Submarine Cable

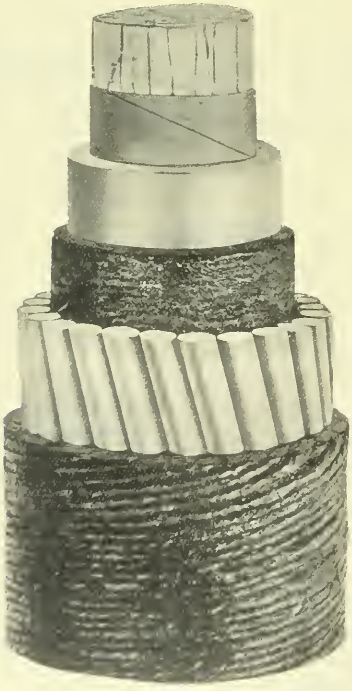
Robt. A Shelly

The accompanying figure represents a full size reproduction of a section of a cable a mile long recently manufactured by the Waterbury Company, of New York, for the Western Union Telegraph Company. The outside diameter of the cable is 2⅓ inches and the total weight when mounted on a 9-foot reel was 26 tons.

The cable core consists of 25 pairs of No. 14 B. & S. gauge copper wires, having a conductivity equal to 98 per cent. of that of pure copper. Each conductor is insulated with three wrappings of special insulating paper, and the conductors are paired with a twist of six inches. The core is covered with three wrappings of special heavy paper over all and after being thoroughly dried out is covered with a sheath of pure lead 3-16 of an inch in thickness.

To protect the lead sheath and serve as a bedding for the armor wires, three reversed servings of soft jute roving saturated with tar compound were first applied to the cable. Upon this bedding, 23 No. 4 B.W.G. galvanized steel armor wires were laid up. Upon the armor wires two reversed servings of hard twisted jute yarn saturated with a preserving compound were placed. The operations of applying the bedding, the armor wires and the final covering of jute yarn were carried on simultaneously.

The final inspection covered the examination into the mechanical details and measurements, together with tests of the electrical properties, which included a test for insulation resistance, specified to be not less than 500 megohms per mile, and a test for electrostatic capacity, specified to be not more than .095 microfarads per mile. The final electrical test was for dielectric strength, using a potential of 2,000 volts applied between each conductor and all of the others, and between all of the conductors and ground. The results of these tests in all instances were entirely satisfactory on this particular cable.



Full Size Submarine Cable

The New Edison Cell

The new Edison cell, with which the inventor himself appears at last to be satisfied, is represented in the accompanying photographs. This cell is claimed to combine compactness, efficiency, long life, and moderate cost both of installation and upkeep. Each cell requires a floor space of from 15 to 20 square inches, a height of 15 inches, weighs from 13.5 to 19 pounds, and has a capacity of from 150 to 225 ampere hours.

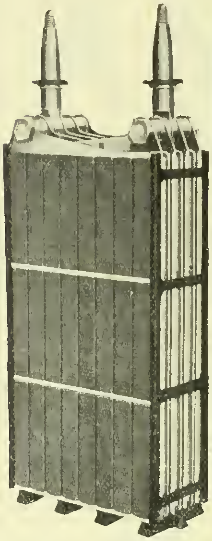


Fig. 1 —Edison Cell

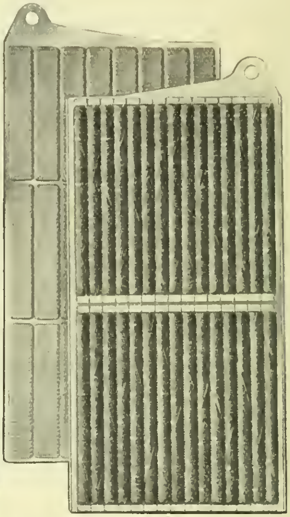


Fig. 2. —Positive Plate in Foreground Negative Plate behind

In the construction of his new cell Edison has drawn away from the old idea of lead plates, and uses instead nickel and iron. The positive plate is made up of 30 steel perforated tubes, about the size of a lead pencil and four inches long, placed side by side in two rows of 15 each, the tubes being filled with pure nickel flakes. The negative plates consist of 24 flat rectangular perforated pockets, in place of the tubes, placed in three rows of eight each (see fig. 2). These are also made of steel, and contain an oxide of iron very similar, it is said, to iron rust. The electrolyte consists of a 21 per cent. solution of caustic potash (KOH) containing a small amount of lithium. Under no conditions are acids to be used.

The claim is made by the inventor that these cells will be found suitable, among other things, for electric traction, each car being supplied with a number of cells, and initial tests along this line at West Orange, N.J., have already shown very satisfactory results.

Canadian Carbon Company Renews Large Order

The Government of Alberta have renewed the contract for batteries for their telephone system for 1910 with the Canadian Carbon Company, Limited, of Toronto, manufacturers of the X cell batteries. The contract specifies shipments of 1775 batteries per month, but the actual number used is in excess of this amount by about 10 per cent.

HOW do you manage in that big place of yours to keep in close touch with all your men? You've got to talk with them occasionally of course, — every man at the head of a business has to talk with his lieutenants now and then. But when you want to talk to John, the foreman, do you send for him, fuss around among the papers relating to the matter in hand until he comes, and waste both his time and your own. How much time in the course of a day—week—month—year—does John waste walking between your office and his own end of the shop—how much time do you waste waiting for him—and how much time do other employees waste in the same way?

Intercommunicating Telephone Systems

keep you in direct touch with the whole of your business — you press a button—lift off the receiver and—talk! That's all.

And you can prove for yourself just what they save you. Suppose you do prove it.

Have one of your clerks keep an eye to-morrow on the amount of time wasted in going back and forth —in looking for information by the members of your institution—information that could be had without leaving the desk if you had a house telephone system.

You will be amazed at the result—the loss of time shown in one single day. Then multiply that time by the number of working days in the year—312—figure it up at, say, the average cost per hour of your employees and—say, it IS staggering, isn't it?

Now go a step further. Write to us. Tell us you would like to know something about our Intercommunicating Telephone Systems and let us tell you what they will save you in the course of a twelvemonth.

"Northern Electric" Intercommunicating Telephone Systems cost little to install, operate on a low maintenance cost and can be kept in perfect working order by anyone with even the most rudimentary knowledge of electricity.

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A New Style Coal Oil Lighting System

Our attention has been called by Mr. R. E. T. Pringle to the operation in Montreal of a lighting company who are extensively advertising and demonstrating a new style coal oil lighting system. The past few years have witnessed the rise and fall of endless gasoline and oil projects, and the appearance of still another lighting proposition should not cause any alarm to central station managers.

Mr. Pringle has taken the trouble to investigate this latest system, and the results of his comparison between the new oil lamp and an electric flame arc lamp are quite interesting. Using an Adams-Bagnall regenerative flame lamp as a basis for his comparison, Mr. Pringle has figured out the cost of operation of this lamp on the circuits of the Montreal Light, Heat & Power Company as follows: The actual wattage consumption of an Adams-Bagnall lamp is 550. The arc lamp rate charged on yearly contracts by the Montreal Light, Heat & Power Company is 15 cents per k.w., which gives 8¼ cents as the cost of operation of this lamp. The rating of the lamp is 3,400 candle power, therefore the cost of operation per 1,000 c.p. becomes .024 cents. Adding to this the cost of carbons, which is estimated at .80 cents per trim over the life of 80 hours, the total cost per 1,000 candle power of the arc lamp (not including labor for trimming or cleaning) is .034 cents per hour. Figuring this cost on the Montreal Light, Heat & Power Company's five year meter contract basis, which is 15 cents per k.w. hour, less 33⅓ per cent., this cost becomes .026 cents per hour per 1,000 candles.

On the other hand, the oil company claims for its lamp an operation cost of from .02 to .025 cents per hour for 1,000 c.p. It is not, however, stated whether this price covers the cost of mantles, cleaning, supplying oil, etc. Another feature of the oil lamp installation, which Mr. Pringle draws attention to, is that insurance companies, on account of the risk from explosion where such installations are made, usually impose a higher rate of insurance. No curves are shown in the oil company's catalogue, nor are there any statements made as to the angles at which the candle power of their lamp is given, so that Mr. Pringle was unable to make a comparison between the two candle power ratings.

The Tungstolier Company of Canada, Limited, through Mr. R. B. Basham, general manager, announces that in the four months since their organization their business has entirely outgrown their former premises and that they have moved to more commodious and richly appointed offices and warerooms at 96 King street west, suite 20, Toronto. The new offices will be equipped with apparatus for demonstrating correct and scientific illumination, to which this company pays expert attention, Mr. Basham being of opinion that a proper reflection and diffusion are as important as the type of lamp used

Canadian Rights for Sale on a Royalty Basis Preferred

The Sunray Electric Lamp Manufacturing Co., 109 West 42nd Street, New York, manufacturers of the celebrated Sunray Electric Arc Lamps for D. C. and A. C. 110 to 250 volts circuits, offers its manufacturing rights for sale outright or on a royalty basis. This is the only lamp offering the advantages of the high efficiency arc without being subject to the numerous difficulties heretofore connected with this type of lighting unit. This lamp has met with great success throughout the United States and offers great possibilities to a wide-awake Canadian concern. Communications invited only with reliable firms. Address direct. 3

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EDITOR'S ANNOUNCEMENT.

Correspondence is invited upon all topics coming legitimately within the scope of this journal. Subscribers can materially assist by sending in news items and information regarding electrical development in all parts of Canada.

Vol. 19 Toronto, April, 1910 No. 4

Annual Convention of the Canadian Electrical Association

The selection of the meeting place of the 1910 Convention of the Canadian Electrical Association was, by resolution of last year's meeting, left with the Managing Committee. In the meantime a vote has been taken by mail, with a view to getting an expression of opinion from the members, with the result that Ottawa and the Royal Muskoka, were the two places most generally favored, and the Managing Committee at a recent meeting Toronto decided upon the latter point, believing that it was advisable to defer going to Ottawa until 1911, when the Chateau Laurier will be completed. The annual convention will therefore be held this year at the Royal Muskoka, Lake Rosseau, on Wednesday, Thursday and Friday, July 6th, 7th and 8th. Mr. W. L. Adams, of the Ontario Power Company, Niagara Falls, has consented to act as Chairman of the Committee of Arrangements, and M. A. L. Mudge, of Smith, Kerry & Chace, Toronto, as Chairman of the Papers Committee. Mr. T. S. Young, Confederation Life Building, Toronto, is Secretary-Treasurer of the Association, from whom all particulars regarding the convention may be obtained.

The Muskoka Lakes district is the finest summer resort district in America, and will undoubtedly be found to be an ideal place for the Convention. The location has many attractions which are not to be found in the larger cities where the Conventions have usually been held. The "Royal Muskoka" is easy of access, being reached by the Grand Trunk, Canadian Pacific and Canadian Northern Railways and the Muskoka Navigation Company's steamers. In a later announcement full particulars regarding transportation will be given. Those in charge of the entertainment features have pledged themselves to provide a programme such as has never been equalled by the Canadian Electrical Association. The arrangements are not sufficiently advanced to permit an announcement of the details, but there will be pleasures for all. Trips around the lakes and other forms of enjoyment will be specially arranged for the ladies.

A word as to new members. You know some central station manager or other electrical man who is not a member of the Association. You also know that it would be to his benefit to come to this Convention and meet his electrical friends. It is your duty to endeavor to induce him to join and make this Convention the best in the history of the Association.

Toronto Railway System and Electrolysis

In view of the troubles a number of cities are experiencing from electrolytic action on water and gas mains, due to stray electric currents, it is pleasing to note the very favorable report just issued by Mr. H. F. Strickland, Chief Inspector Canadian Fire Underwriters' Association, on the conditions in Toronto.

The report classifies the various methods of protection against electrolysis under three heads: (1) The conduit system for return wires, as used in New York and Washington, etc., and now being installed in certain sections in Winnipeg; (2) the double overhead trolley system as operated in Cincinnati and on various suburban lines in the District of Columbia, and (3) the modern bonding system, as used by the Toronto Railway Company. Mr. Strickland is of opinion that the latter system, very carefully installed, is the equal of either of the others, and in this connection says:

"I am pleased to state that the Toronto Railway Company have their rails well bonded. During the past season the company have tested 20,603 rail bonds. These figures I have verified by having had the privilege of seeing the original reports made by their testing department to their chief electrical engineer, and I have also been present when a number of these tests were made, and out of the total 20,603 joints tested only 193 were found faulty—a very small number indeed. The engineer's data shows that these faulty joints have been remedied, tested, and reported in good order.

"In section of track on Front street, from George to Bathurst, 406 joints were tested, and there was not a faulty joint found in the entire distance.

"Referring to the efficiency of the rail bonds, it is also very satisfactory to know that the required efficiency of this bonding, as determined by instruments which give a positive reading, is higher than the English Board of Trade regulations. This standard calls for not more than one-half volt loss for every 300 feet of track. The Toronto Railway average approximately one-half volt to every 500 feet.

"Summarizing the situation, I would say that the Toronto Railway have a first-rate negative system, and have taken great precautions to prevent stray currents and the resulting damage therefrom, and the indications are that stray currents from the Toronto Railway are protected as far as possible with the system in vogue."

Judgment Given for Insurance Company

As a result of a great many fires occuring in Quebec city which were attributed to defective outside wiring, such fires occurring at one period at the rate of one every day for six consecutive days, Mr. J. J. Bennett, Chief Electrical Inspector for the Province of Quebec, was instructed to take action against certain of the lighting companies; this plan being followed as the best means of drawing the attention of the lighting companies to the seriousness of the situation.

The specific case in which judgment has just been given against the lighting company was an action on the part of the

Yorkshire Fire Assurance Company to recover from the Quebec Jacques Cartier Electric Company a payment made to a householder whose property had suffered damage by fire. The case was argued before His Lordship Judge McCorkill. In the evidence taken, two witnesses were able to swear that a wire belonging to the electric company actually touched the roof of the damaged building a few minutes after the fire. In summing up, His Lordship recalled this evidence and added: "It does not appear that anything happened to the wire at the time of the fire to have made it touch. It touched naturally in its descent from the top of the adjoining roof to the ground. I am of opinion that the plaintiff's evidence sufficiently establishes the presumption that the fire originated from the defective wiring of the defendant's electrical system. It was responsible for the fire which occurred. Plaintiff paid the loss and is entitled to be reimbursed by the defendant. Judgment, therefore, goes for plaintiff for the amount sued for, with costs."

This judgment will be of interest to our readers, inasmuch as, we believe, it establishes a precedent.

The New Telephone Bill

The new Telephone Act, passed by the Ontario Legislature, marks a distinct forward step in the progress of telephone matters in Canada. By its provisions the various Ontario companies, whether operated by a municipality, a private individual or a company, if they operate under provincial charter, are now subject to the Railway and Municipal Board. To this Board all tolls and rates, all agreements with other companies of whatever status, i.e., whether Provincial or Dominion, must be submitted for approval, and all disagreements and complaints for adjustment. By the terms of the new Act no company can refuse to connect with any other company, nor can any company refuse telephone service to any applicant. This, of course, applies to provincial companies only.

The section which doubtless pleases the independent telephone supporters most is that which makes it illegal for any company to enter into an agreement with any other company, whether Provincial or Dominion, which has for its object the increase in cost of telephone service or the restriction of competition, until such agreement has been approved by the Board. The making of such agreements has, it is claimed, constituted a great handicap to the independent system, inasmuch as, in many places where fair competition has, in the past, been established, it has been the policy of the Bell Company to step in and either purchase the smaller line or by giving long distance or some such privilege in exchange for the right to compete, has tied the hands of the smaller company and destroyed any possibility either of competition or expansion.

In the light of these conditions it would appear that the present moment is an opportune one for the various units of the Independent Association to get together, and, by a united front and using the effective weapon the Government has furnished them, at once strengthen their position and extend their field of useful operation.

Monthly Meeting Toronto Section A.I.E.E.

More than usual interest attached to the March meeting of the Toronto section of the American Institute of Electrical Engineers, owing to the presentation of a paper on two of Sweden's hydraulic installations by the distinguished consulting engineer Mr. Jens Orten-Boving, who is responsible for the installations, as well as for the manufacture of the hydraulic part of the machinery.

Mr. Boving is immensely pleased with the magnitude and efficiency of Canadian generating plants, and his opinion in this respect carries all the more weight in that his experience covers extensive operations in Sweden, Germany, Switzerland, England and Scotland. One feature with which he is especially impressed is the greater magnificence of our power house exteriors which, he states, is considered a matter of very minor importance in Sweden, where plants are installed with incredibly small capital expenditure, the outlay in some cases not reaching $40 per horse-power capacity and never much exceeding that sum.

The main points of difference between American and Swedish engineering practice as brought out in Mr. Boving's paper seem to be: (1) The low cost of construction; (2) slower speed turbines, the approved practice in Sweden being about 100 r.p.m., which, the speaker explained, give greater efficiency at anything less than 90 per cent. full load; (3) central turbine bearings, which are preferred rather than a heavy shaft requiring only end bearings, and (4) forced grease lubrication instead of oil, a very liquid grease or thick oil being found best in practice.

The speaker later described a Scotch plant operating under a head of 970 feet and using Pelton type turbines, which installation had cost only $115 per horse-power. For this plant an open canal three and one-half miles long, built of reinforced concrete, and six closed pipes six feet in diameter and one and one-half miles in length feed the turbines.

In addition to being an engineer of repute, Mr. Boving is head of the Jens Orten-Boving Company of Sweden, manufacturers of low pressure turbines, a branch of which also operates in London, England, for the manufacture of high pressure turbines and pumps, and another in Scotland manufacturing welded metal pipes. Mr. Boving's present mission in Canada is in connection with the formation of the Canadian Boving Company for the introduction and installation of turbines and other hydraulic apparatus. Already two Canadian plants, Winnipeg municipal and Calgary, have contracted for this firm's turbines.

Mr. Jens Orten-Boving.

The Privy Council vs. Ontario Legislature

The Privy Council's decision in the matter of whether the city of Toronto or the railway company shall name the streets along which extensions shall be made is entirely favorable to the company. In the meantime, however, the city has foreseen this probability and has taken steps to have introduced in the local house a measure which overrides this part of the agreement with the railway company and places the onus of decision on the shoulders of the Railway and Municipal Board. In taking this step it is open to argument that the Legislature has, whether intentionally or not, been guilty of deliberately annulling a contract between two parties, to which both had given willing consent and under the conditions of which both had worked for some years, as a result of political pressure on the part of the city authorities. This opinion is based on the reported utterances of more than one of the Controllers, one of whom is made to say in effect in the earlier stages of the fight: "Is this all we get from a Conservative Government after what Toronto has done for the party?" If this utterance was correctly reported, Toronto was seeking favors in its new bill and not justice. As the matter stands, however, it is hopeful that under the direction of the Railway Board, which has time and again shown itself both capable and impartial, matters will be adjusted to suit both parties, and Toronto should get her much needed extensions.

In the other features of the bill by which the city gets the right to build in the new sections or to build on such streets within the old limits as the present company may refuse to use, it is difficult to see any particular advantage that can possibly follow. It has been suggested, of course, that these outlying sections would act as tributaries to the projected tubes, but it is doubtful if there is the remotest chance of the construction of such a system in Toronto for many years. Toronto has not the capital nor, with her 350,000, does she require such a means of transportation. On the other hand, without the tubes, the short outlying lines would be of little use, since transfers could not be made to the company's lines.

The Electrolysis of a Bed

The citizens of Hamilton have been very much exercised. We had previously been under the impression that everyone knew something about electricity—enough at least to know its impossibilities. The wonderful feats, however, with which the vagrant energy of the Hamilton Street Railway Company has been credited have convinced us that there is just one person in Canada who essays to write about a subject of which he must know less than nothing, the man who is either such a stupid fellow or such a bad joker as to use expressions like "the electrolysis of a bed" and kindred phrases. There is only one mild word that expresses the situation, that is, impossible. It is very possible some stray currents are leaving the returns at certain points, or that the metal beds may have accumulated a slight static charge from more than one cause, but that is no reason for resorting to such lamentable inaccuracy of statements. We understand the situation is quite well understood by those competent to judge, and the remedy is forthcoming if remedy is asked. The people of Hamilton are, we have been assured, again occupying beds and venturing in the vicinity of hydrants.

Activity in Ottawa Car Company's Works

The Ottawa Car Company is at present completing orders for the following: Quebec Railway Company, Hamilton Electric Company, British Columbia Electric Railway, Montreal Street Railway, and Calgary Railway.

The Quebec order is for two large double truck cars sixty feet long, 10 feet 2 inch beam. These are equipped with Westinghouse apparatus, including air brake. They are beautifully finished in white oak. These cars are for suburban service. They are divided into two compartments, viz., baggage and passenger. The passenger compartment is fitted with twenty crosswise rattan seats. Car contains one lavatory. Delivery, one and a half months from date.

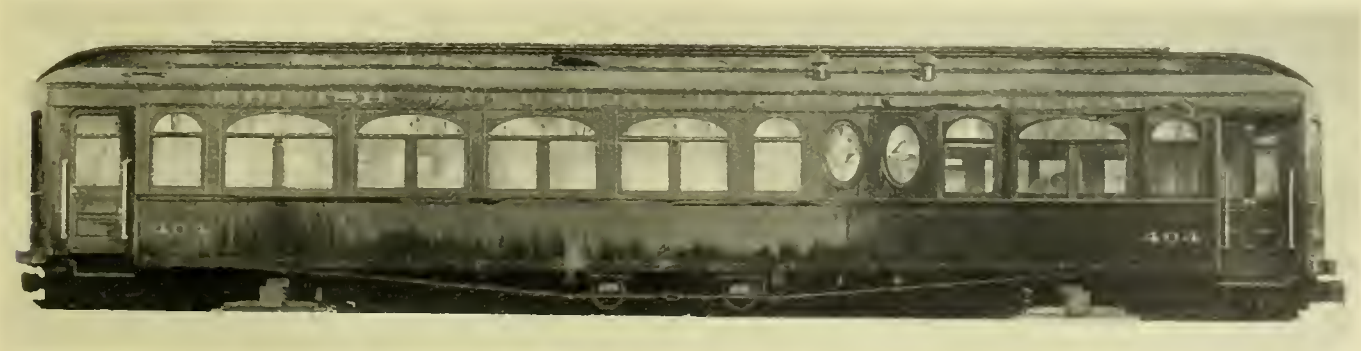
The British Columbia Electric Railway Company has on order four cars of the following type: Length 55 feet, width 8 feet 7 inches, height 13 feet 4 inches. These cars are superbly finished in mahogany, with inlay. Outside is finished in two colors of green; a rich olive and a Pullman green. They are fitted with double truck four motor type, each motor having a capacity of 75 h.p. and equipped with multiple unit control. This is an admirable car for suburban service, being divided into three, viz., passenger, smoking and baggage, with two lavatories. Cross rattan seats electrically heated, air whistle and sander. Two of these cars were shipped March 3rd, 1910, and two more will be shipped within a month. Besides the order for above, there are five cars of a similar type, to be delivered in two months, 30 feet 6 inches long and 8 feet 2 inch beam, omnibus side, pay-as-you-enter patent, interior finish to be California cherry.

Interior of B. C. E. R. Company's New Coaches.

Hamilton Railway Company have an order for a three months delivery for five cars 43 feet long, 6 foot vestibule and an 8 foot 4 inch beam, omnibus side, longitudinal seats, capacity forty people, double truck, hand brake. Interior finish to be cherry.

Calgary—Three cars, 30 foot 6 inch bodies, 8 foot 6 inch width, 7 foot vestibule, pay-as-you-enter, single end control. Sash and window arranged to drop, double truck, monitor roof, General Electric air brakes, motors and sander, electric heaters, cross seats. Interior finish to be in red cherry.

The Montreal Street Railway now has under order some twenty-five steel cars. These cars are of a special type and are under a separate department of the Ottawa Car Company. The sills and sub-base are of channel iron and the body of sheet steel. They are, in general design, the same as the present larger type of the pay-as-you-enter cars used in Montreal.



Body of one of B. C. E. R. Company's New 55 Foot Coaches, Ready for Shipment.

The Commercial Cable Company's Anniversary

Under the heading "Silver Anniversary of the Commercial Cable Company," a booklet has just been issued descriptive of the progress of this company during the twenty-five years of its existence. The Commercial Cable Company was incorporated in 1883 by John W. Mackay, and James Gordon Bennett, and operations were commenced in December, 1884, with two trans-Atlantic cables between Nova Scotia and Ireland, and some shorter lines, totalling in all 7,762 miles. At the present time the company owns and operates five trans-atlantic cables, and in addition operates two German Atlantic cables, total 28,347 miles.

During this twenty-five years, realizing the importance of land line connections to feed the cables, the management has also gradually acquired a system of land lines known as the Postal Telegraph Company, comprising at the present time over 330,000 miles of wire. This combination now constitutes the largest system of submarine cables and land telegraphs in existence, stretching in unbroken connection two-thirds of the way round the world and connecting the continents of Asia, Europe and America.

The first trans-atlantic cable ever transmitted was that sent on August 5, 1858, to Queen Victoria, over the Atlantic Cable Company's lines by the company's president.

Western Power & Light Company for Brandon

Mr. Cecil B. Smith, of the firm of Smith, Kerry and Chace, representing the Western Power & Light Company, has laid before the City Council of Brandon a proposition dealing with the development of a water power on the Assiniboine river, eight miles east of Brandon, to supply this city with light and power. The proposition states that 2,000 h.p. can be developed at this point, with a night service of about 3,000 h.p.

The plan is conditional on the company receiving a 30-year franchise and on the city's agreeing to guarantee the bonds of the company to the extent of $300,000.

In return for these privileges the company binds itself to be ready to deliver power within sixteen months of the granting of the franchise, and to extend its distribution system as demand requires.

A rough schedule of rates, which it is maintained is lower than obtains in other cities of the same size and conditions as Brandon, was submitted to the council for consideration, and is briefly as follows: 200 h.p. or over, $36 per h.p., varying all the way down to from 10 to 20 h.p., for which a rate of $52.50 is submitted. For less than 10 h.p. meter rates will govern. The lighting schedule submitted provides for either meter or flat rate, the meter rate to be 10 cents per k.w.h., with 20 per cent. discount and a further discount up to a maximum of 20 per cent. where the amount runs over $100 a month; meter rental at 25 cents a month to be charged. On flat rate the first 16 c.p. lamp would cost 50 cents a month, the second lamp 45 cents a month, the third 40 cents, fourth 35 cents, fifth 30 cents, additional 25 cents each month. First lamps will be installed free, but renewals must be paid for by the consumer.

Ottawa Electric Company Making Additions

The Ottawa Electric Company has well under way the reconstruction of their old No. 2 power house. This power house heretofore consisted of a four unit, 560 h.p. each, 22 foot head development, aggregating 2,240 h.p. The runners are horizontal shaft type, belted to two phase Westinghouse generators. The building of the "Great Chaudiere Dam" and the other storage dams, higher up the Ottawa river, made it possible for them to take advantage of a higher head and a greater flow of water, and hense the present changes to their power house. Provision has been made to install four 18 inch Morgan Smith horizontal type water turbine , each of 1,800 h.p. at 180 r.p.m. 30 foot head; only two are being put in at present. These will be direct connected to two Westinghouse generators, 2 phase, 60 cycles, 2,300 volts, 180 r.p.m., revolving field type. Water wheels are provided for two exciter units. In addition to the above an auxiliary motor generator exciter set will be provided.

The power house proper is a building of limestone some 141 feet by 50 feet. All along one wall of this, some twelve feet from the floor, will be a twelve foot gallery. In this gallery upon ornamented posts will be mounted the necessary instruments. Desk distant control switches are to be used, and in time this will be made the distributing switch gallery and will have tied into it the Ottawa Electric Company's several other stations.

Regina Installs Exhaust Steam Turbine

An interesting installation is in process of erection at Regina, Saskatchewan. The municipal lighting plant is being enlarged by the addition of a 500 k.v.a. generator, which is to be driven by a Westinghouse low-pressure steam turbine. The turbine will utilize the exhaust steam from the reciprocating units installed at present, viz.: One 100 kw. generator driven by a tandem compound Goldie-McCullough condensing engine, and a 300 kw. generator driven by a tandem compound Corliss non-condensing engine built by John Inglis & Son. The addition to the capacity of the plant will be secured without the necessity of any increased boiler capacity.

The report of Mr. E. W. Bull, superintendent of the municipal electric light and power plant, of Regina, for the past year, states that after paying all interest and sinking fund, the year's operation of the city's plant shows a net surplus of $27,844. It is proposed to use this surplus on additional equipment, and a material reduction in the already low rates in Regina will probably be made.

Regina expects to have an electric railway in the near future. A franchise has been applied for by a private corporation. Mayor Williams; Mr. Darke, chairman of the Fire, Water and Light Committee; Mr. McDonald, City Solicitor, and Alderman Sinton, have been recently in Winnipeg consulting with Colonel Ruttan, City Engineer, and others, regarding the terms of the franchise.

Recent C. G. E. Contracts Constitute a Record

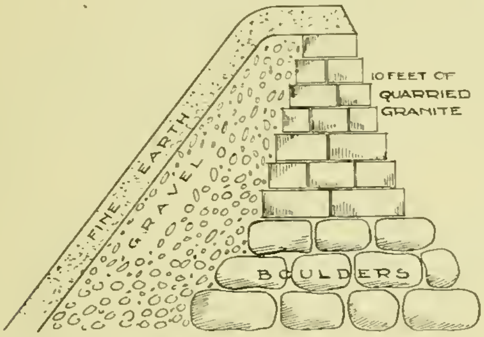
Nothing can be more pleasing to Canadians than to note the rapid progress and increasing prosperity of such an organization as the Canadian General Electric Company, not alone in that it is controlled and operated by Canadians and that its extensive factories are located in Canada, but also because the success of this organization has been gained through the keenest kind of competition with the best and largest firms in the United States and the European continent. This expression is called forth by the announcement within the last few days that several exceptionally large contracts have been awarded to the Canadian General Electric Company, which in point of magnitude, we believe constitute a record, certainly in Canada, and possibly in the whole world. These facts once more emphasize the tremendous magnitude of Canadian water resources, the enormously increasing demand for hydro-electric power with the consequent demand for capital, and above all the aggressive ability of Canadian companies with the necessary enterprise and manufacturing facilities to take foremost rank in the contest for the world's business.

The recent contracts alluded to above include an order from the Electrical Development Company, of Niagara Falls, referred to elsewhere in this issue, for three enormous generators of 15,000 h.p. each. Another contract of equal importance has been entered into with the Ontario Power Company, who have closed with the Canadian firm for the supply of three units, each of 12,500 h.p. capacity. Still another contract with the Western Canada Power Company, who are installing a large plant at Stave Lake, near Vancouver, B.C., calls for two 10,000 h.p. units. These three orders alone make up a total of over 100,000 h.p., and it is stated by the General Manager, Mr. Frederic Nicholls, that the sum total of the smaller orders recently received would add up to about as much more.

All of this has been accomplished so quietly that one hardly realizes its tremendous importance, not only to the manufacturing company but also to Canada as a whole. The addition of 200,000 h.p. to the output of producing electrical companies means that they must see ahead a market for the use of that amount of power, which in turn means that millions of dollars will be spent in new mills, factories and machinery, and additional employment given to thousands of workmen in our own country.

The Progressive Town of Shelburne

The Town of Shelburne, Nova Scotia, has recently installed a hydro-electric plant at Morine's Falls, on the Roseway river, these falls being situated just within the town limits. The present installation has a capacity of 200 h.p. and provision is made for a second unit of similar size. The turbine wheel is an 18 inch centre discharge, horizontal shaft type, direct connected to a Canadian General Electric 200 h.p. 450 r.p.m. generator. The turbine operates under a head of 25 feet, fed by 40 foot steel pipe. It is worthy of note that the dams and masonry are constructed of granite and that the total cost of equipment did not exceed $25,000. The further fact that work commenced on this plant on July 15 last, and that the lights were turned on in the town on February 7, less than eight months later, reflects the greatest credit on the vigorous committee which had this work in charge and which consisted of Mayor Robert A. Bruce, together with Messrs. James R. Bower, J. Frank Dexter and Ed. L. Bower. The street lighting system also is entirely new, the town being lighted throughout with 40 c.p. tungstens. The verdict of the townspeople is that these lamps give a most satisfactory service.



Type of Masonry in Shelbourne's Water Dam.

Present and Future; Real vs. Ideal

We are indebted to the secretary of the Canadian Independent Telephone Association for a detailed description, in this issue, of the telechronometer, an instrument which first saw the light of day at the recent National Association convention in Chicago. Briefly stated, the telechronometer is an instrument designed to measure the length of time a telephone is used, just as a gas meter measures the volume of gas or a watt-meter th quantity of electric current consumed.

While at first thought the invention may seem to involve too much of the ideal to be practical, a more mature consideration does not appear to oppose any serious obstacles to the system. It is a matter of service in each case for which you pay so much, the real difference being that in the case of gas and electricity you pay practically for what you use, while in the matter of telephone service you pay whether for use or not. There is probably, nowhere in existence such another unfair discrimination against the small consumer as exists in telephone service, where the condition often obtains that a customer who uses his instrumnt once a day or else pays as much as another who uses it twenty or perhaps fifty times a day. If such a system could be worked out on a financial basis so that everyone could have a 'phone in his house for the asking, subject to a small rental, as is the case in many gas and electric plants, and with a meter attached to indicate the time the instrument is actually used, the problem of universal telephone usage would be solved as no scheme of telephone duplication with competitive rates can ever hope to do. This ideal system would also put a stop to the unnecessary uses to which a telephone is often put, the uses that delay and inconvenience important business matters.

The whole question resolves itself into the attitude of the public toward telephone service. Because he looks upon it as a luxury, the ordinary householder is willing to pay a luxurious price, feeling that he would rather do this than be without his telephone; but just as soon as a telephone in every home, rich and poor alike, comes to be considered as much a necessity as gas or electric light, which it is, just so soon the present uneven system of payment of service will be evident to all and public demand will require some such simple and equitable arrangement as the one described above.

Development of La Colle Falls

Prince Albert is at last taking determined steps towards the acquiring and development of a municipal hydro-electric power plant and to this end recently engaged Mr. C. H. Mitchell of the engineering firm of Mitchell & Mitchell, Toronto, to make a detailed estimate of the possibilities at La Colle Falls. These falls are situated on the North Saskatchewan river, about 25 miles from Prince Albert.

The conditions for power development, according to Mr. Mitchell's report, are very favorable. The Saskatchewan river rises in the Rocky Mountains, some eleven hundred miles west of Prince Albert, and is fed from a watershed of about 65,000 square miles, so that the volume of water even in the driest season is large. At the point where it is proposed to locate the dam a fall of about 28 feet can be obtained and, under minimum water flow, 10,000 horse-power can be developed. At this point there is a natural ravine available for a forebay, by the construction of a 750 foot dam, the forebay to be supplied by a canal about a mile long, which would tap the Saskatchewan river.

Being a low head, the proposed plan of development calls for a number of, probably three, turbines to each generator, the latter to be installed on vertical shafts. The initial installation would probably be four 1,000 h.p. units with plans to add six more similar units as the town develops.

It is estimated power can be delivered at the city limits for in the neighborhood of $20 per horse-power per year. Prince Albert's population is in the neighborhood of 8,000.

Dufferin Light & Power Company

This company was incorporated in October, 1908, for the purpose of taking over the Orangeville and Shelburne electric lighting and steam plants and franchises and a water power two miles east of Horning's mills with a possible development of 1,000 h.p. For immediate use the company has leased, for a term of twenty years, an already developed water power at Huxtable's mills yielding about 150 horse-power. Having in view the larger installation, a transmission line has been constructed from the smaller power plant to Orangeville by way of Shelburne, a distance of twenty-two miles, to both of which towns power is now being supplied. Cedar poles are used, 30 feet high, 7 inches top, 125 feet apart. Current is carried by No. 6 bare copper wires at 22,000 volts. There are substations at both Orangeville and Shelburne.

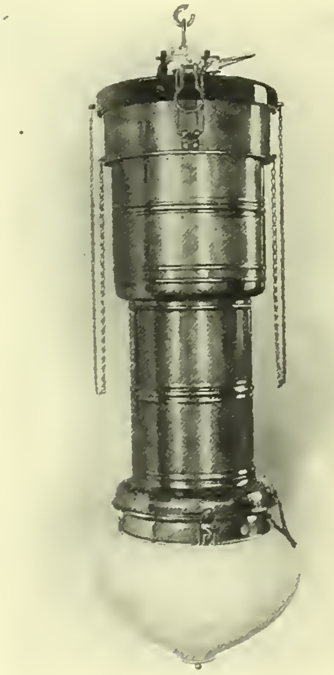
Preparations are being made for the construction of the dam for the 1,000 h.p. development, which will be about 40 feet high and 300 feet long. The area of the forebay when completed will be about 70 acres. Leaving the forebay, the water will pass first through a 42 inch wooden pipe 2,000 feet long into a 36 inch steel pipe 1,000 feet long, into the turbines. These will operate under a 136 foot head and be direct connected to 3 phase 60 cycle generators.

The company is enjoying a growing and profitable business, and is making, we understand, preparations for the extension of their transmission lines to Dundalk, Grand Valley and Arthur.

Toronto Armouries' New Lighting Installation

In these days of high efficiency lighting the importance of the flaming arc type of lamp is daily becoming more marked. Some flaming arc lamps have an efficiency of as high as .25 watts per c.p. Where a large unit of light can be used to advantage, such as illuminating skating rinks, halls, or other large enclosed or open areas, the flaming arc offers an unrivalled means of illuminating, both with respect to first cost, operating cost and general appearance.

An excellent example of this type of light is seen in the recent installation at the Armouries, Toronto, where 12 Helios direct current flaming arc lamps have displaced nearly 40 open arcs. The energy consumption of the two types of lamps is practically the same and therefore the actual reduction in operating expense has been very marked; at the same time much more satisfactory results from an illuminating point of view are being obtained. The light from the Helios flaming arc is of nearly uniform value in every direction below 15 degrees from the horizontal. It is, therefore, apparent that the light is distributed below, where it is most required, and all objectionable shadows are avoided.



The type of lamp used is the 24 hour type, taking 500 watts and 9 1-4 amp. per lamp. In each lamp there is a self-containing cutout and resistance. The Helios Company have also developed a similar type of lamp suitable for circuits which contains a transformer in the top of the case. This lamp operates direct from 110 volt mains, lasts 22 hours per trim and consumes only 335 watts.

Electricity Gets Needless Blame

Apropos of correspondence that has appeared in the Electrical News on the question of fires being caused by electricity, we believe that both writers have the same prime object in view, though they are, from the nature of the high positions they both occupy, looking at the matter from different aspects. Mr. Strickland justly claims that a very great deal has been done by constant vigilance towards raising the standard of electrical construction and wiring in buildings and quite justly calls for the support of the electrical fraternity in furthering this good work. Mr. Ginder readily acquiesces in this point of view, but, without doubt, expresses an undeniable fact when he states in a second letter that "electricity is blamed for numberless fires the causes of which are entirely different." The following extract from Mr. Ginder's second letter makes his point of view, we believe, quite clear:—

Editor Canadian Electrical News:

Dear Sir,—

I certainly was not thinking of the chief inspector of the Canadian Fire Underwriters' Association when writing my letter. This gentleman has evidently misunderstood my point in this communication, as I argued that, with the immensely superior installations at present in use, it was absurd for fire commissioners invariably to bring in a finding that the immense majority of fires were caused by electricity, and it was with diffidence that I took up this question, and I trust I have not encroached on the duties of the chief inspector.

There is, I am aware, a great deal in this subject of interest to the electrical trade, and in no way would I advise hasty action, but I still am of the opinion that electricity is blamed for numberless fires, the causes of which are entirely different.

The Canadian Tungsten Lamp Co., Ltd.,
(Signed) W. H. Ginder, Pres.

Electrical Progress in Ottawa

A large American Pulp & Paper Company is enquiring into possibility of power with a view to locating here.

J. R. Booth's new power house, a hydro-electric development, is ready for use. This is an Allis-Chalmers installation throughout. Generators, waterwheels and governors, etc., aggregating 5,000 kw.

The W. C. Edwards Company is installing a new steam turbine unit of 1,500 kw. capacity.

The Ottawa Electric Railway have purchased a water power at the Chaudiere for $100,000 from the Ottawa Investment Company, and are preparing plans so that they may go ahead and develop this power in order to cope with the increased demand of the street railway.

It is rumored that a German tungsten lamp company is to locate here and develop water power on the Gatineau river.

Analysis of Manitoba Telephone Report

The report of the Manitoba Telephone Commissioners for the year 1909 shows that the telephone system of the province now comprises 5,180 miles of toll lines and 25,300 subscribers, an increase of 1,830 miles of toll lines and 11,000 subscribers since the system was taken over by the Government.

These figures include 7,000 farmers' telephones, 3,900 of which are operated by municipalities and small companies. The Government rate for farm service is $20 per annum.

The capital expenditure at the end of 1909 was $5,102,978, or $238.45 per telephone.

The following is a statement of the receipts and expenditures of the operating department:—

Revenue for year		$757,143
Operating expenditure	$230,028	
Maintenance Expenditure	173,124	
General expenditure	57,364	
		460,516
Net revenue		$296,627

The interest on debentures, and sinking fund (5.05 per cent. on $5,000,000) would require $252,500, leaving a balance of $44,122, as a result of the year's operations. If the moderate allowance of 5 per cent. was set aside for depreciation, this balance would be converted into a deficit of $205,878. The report further does not show that any provision has been made for an unearned rental reserve.

Campbell Lumber Company Instal Machinery

This enterprising company of Weymouth Bridge, Nova Scotia, has planned to install at their pulp mill, electric direct drives on all the machines in order to do away with belting, oil, shafting, etc.

The company controls two falls on the same river about six miles apart, at each of which a pulp mill is in operation. It is now proposed to install at the upper fall, known as Sissiboo Falls, an electric generating plant. This fall has a calculated capacity of from 100 to 150 horse-power. Contracts have not yet, we understand, been awarded for any of the work or machinery in connection with the electrical installations.

Contracts at Big Chute Power Development

The contracts for the machinery for the Big Chute power development on the Severn River have been recently let. The hydraulic machinery contract, which will include up to five 1,300 h.p. double runner turbines with two 200 h.p. exciter turbines, has been let to the William Hamilton Company, of Peterborough, who are manufacturing under the Leffel designs; the two feed pipes with the regulating stand pipes will be furnished by the same company. All the electrical machinery will be furnished by the Canadian Westinghouse Company, and the contracts cover up to five 900 k.v.a. generators and two 100 kw. exciters with transformers, switching and lighting arrestor equipment for both the Big Chute and the Midland stations. The line wire is being supplied by the Northern Aluminum Company and the insulators by the Pittsburg High Voltage Insulator Company. The general construction of the works has been under way for some time by Pratt & McDougall, of Midland, and we are informed that the foundations of the power house are now well under way, while the upper works have been completed for some time.

As stated in our last issue, this plant is being constructed for the Simcoe Railway & Power Company, Limited, of Midland, who intend to supply the large power market in the vicinity of Midland, and will ultimately construct an electric railroad to serve that district.

A Two-Piece Transition Rail

The accompanying sketch represents a two-piece rail, the joint invention of Mr. T. S. Scott, Toronto's principal assistant city engineer, and Mr. Murray A. Stewart, roadways engineer, which, it is claimed, will solve the hitherto impossible problem of running Toronto suburban cars and Toronto city cars on the same tracks.

The Toronto Street Railway gauge is 4 feet 10 7-8 inches, a distance between rails which is not approved in present day traction practice where the narrower width of 4 feet 8 1-2 inches has come to be adopted as the standard. The Toronto & York Radial Railway is standard gauge, hence the impossibility, under present condtions, of extending the Yonge street system north beyond the C. P. R. tracks. It is pointed out that the Toronto Railway gauge, not being the standard, is the one to change, but this change with the ordinary T or grooved rail has never been seriously considered, as it would mean the complete tying up of the system while the necessary changes were being made, both to tracks and coaches, an operation that would doubtless occupy many months.

The present invention is specially adapted for use in such a transition stage as that outlined above, since with this rail the inventors claim it would be a simple matter to run cars equipped for either gauge on any route. The change in gauge, route by route, could therefore be made as quickly or as slowly as desired, as could also the necessary accompanying changes in the car trucks.

As seen in Fig. 1, the rail would be rolled in two sections. The assembled parts rest on a chair, consisting of a malleable casting which is also a separator, as shown in Fig. 2, and are held together with stout bolts. Details of manufacture are not yet complete, but we understand more than one steel company has expressed its willingness to undertake the work and close estimates of the cost of such a rail will probably be available in the near future.

Mr. W. L. Bird, manager and secretary of the Kaministiquia Power Company, Fort William, was in Montreal recently in consultation with Mr. R. S. Kelsch, consulting engineer for this company, regarding proposed improvements and extensions. The company have under consideration the installation of an additional 10,000 kw. unit to take care of the new contract which was recently made through the Ontario Hydro-Electric Power Commission for the supply of electric power to Port Arthur.

Messrs. Ross & Holgate, consulting engineers, Montreal, are engaged in making a report upon the operating conditions of the power plant of the Canadian Sheet Steel Corporation of Morrisburg, Ont. This company recently assigned, and the report is being made with the idea of increasing the efficiency of the plant for the newly organized company who have taken charge.

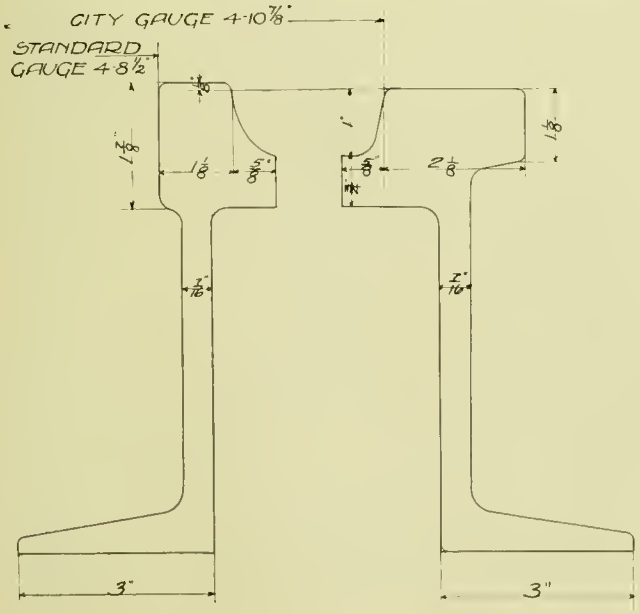


Fig. 1—Two-Piece Rail for Coaches of Different Gauge.

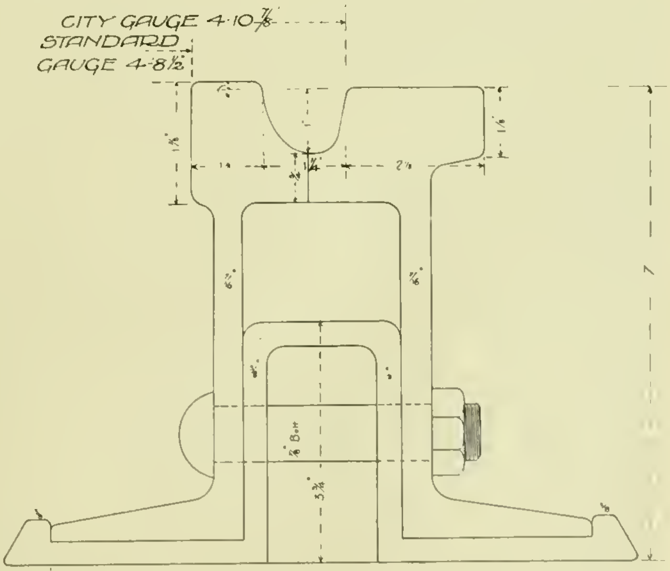
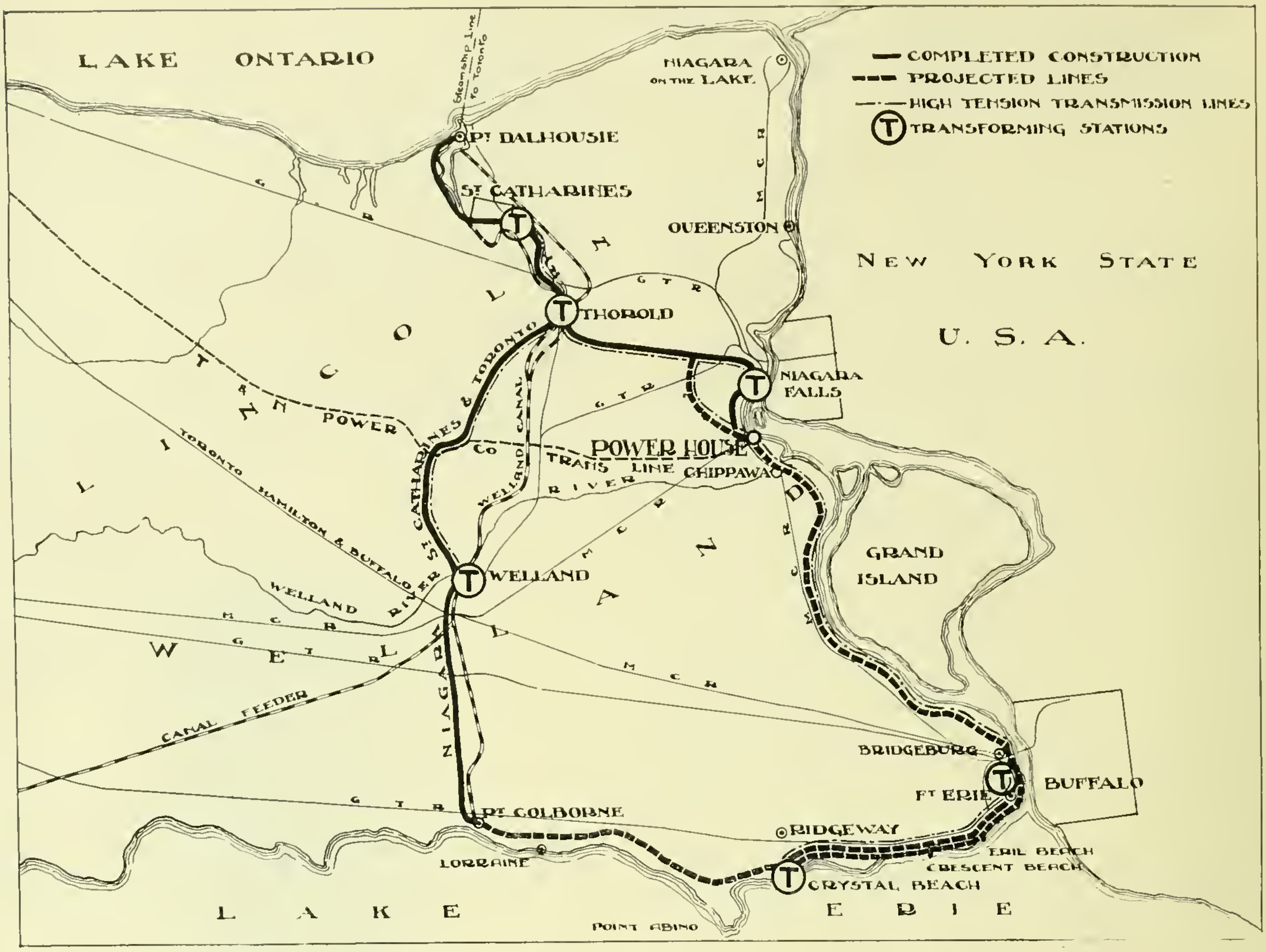


Fig. 2—Two Pieces Assembled Ready for Laying.



Niagara, St. Cath. and Toronto Railway

Big Extensions now in Progress—Port Colborne to be Joined with Fort Erie—Part will be Double Tracked—Eighty Pound Rails used

The accompanying map indicates the operations of what is rapidly becoming one of the most comprehensive radials systems in Canada, serving, as it does, such a prominent section as the Niagara Peninsula and endeavoring by the excellence of its roadbed construction, its up-to-date rolling stock, its well-arranged schedule and its able management, to supply this area with transportation facilities equal to that enjoyed by any section of Ontario. The Niagara, St. Catharines & Toronto Railway Company was organized in 1899 under Dominion Government charter, which gives it the same rights and privileges as a steam road, is constructed almost entirely on private right of way, owned by the company, and, when present projections are completed, will have from 100 to 110 miles of single track railway.

The system was designed and for a time operated as a steam railway, but has been electrified step by step, and at the present time is entirely operated by electricity.

Extent of Railway Lines.

As shown on the sketch, the system at the present moment comprises about 60 miles of single track connecting Niagara, Thorold, St. Catharines, Port Dalhousie, Welland, etc. The extension connecting Welland with Port Colborne, on which work has been rushed during the past few months, is practically completed and will be ready for early spring traffic. The plans for the immediate future include a further extension from Port Colborne to Fort Erie and Bridgeburg, and simultaneously, it is expected, the line will be extended south from Niagara Falls to Fort Erie to complete the loop. With favorable conditions, it is hoped to have most of these lines in operation during 1911.

The company anticipates that the traffic over part of the new line will be exceedingly heavy from the start. This will be especially the case between Fort Erie and Crystal Beach, to take care of which a double track will be laid, as shown in the figure. The remainder of the line will for the present be single track.

The location of that part of the line between Fort Erie and Niagara Falls is not as yet fixed, but it is probably the road will be constructed along the strip of boulevard which the Ontario Government has planned to retain along the Niagara river throughout this distance, and on which provision has been made for the construction of an electric road. If not on this boulevard, the railway line will run very close to it at all points.

A further addition to the lines which it is calculated will serve the interests of a through passenger traffic, more particularly from Port Dalhousie, St. Catharines, Thorold and surrounding neighborhood to Buffalo will, within the next couple of years, leave the main line, which at present leads direct to Niagara, some four miles west of that point, and connect again, as shown in the figure, with the main line just south of the Falls.

This will shorten the schedule time of the through trip to Buffalo appreciably.

Standard gauge 4 feet 8 1-2 inches is used throughout.

The Roadbed.

The present 60 miles of railway line is laid, part with 60 pound rails, but chiefly with 80 pound rails, the latter throughout the main line, where the traffic is heaviest or where there is promise of developing a heavy freight business in the near future. On the 1910 extensions some 60 pound rails will be used, but in view of the unusually heavy traffic expected along the Lake Erie shore 80 pound rails are to be laid at least on that part of the road which is being double tracked, i.e., between Crystal Beach and Fort Erie. The roadbed is as substantially built as for a steam railway, and for the most part very level, so that a rapid and comfortable passenger service will be possible throughout the system. A very large freight tonnage is already being handled, and it is the company's intention to extend this accommodation in the new area to be covered, to run sidings wherever required and so assist in every way in the development of that section of the country through which the system passes.

The Power Lines.

Electric power for the entire system is supplied by the Electrical Development Company, of Niagara Falls. The transmission lines are shown in the figure. The high tension wires carry the current, which is a.c. 3 phase 66 cycle, at 11,000 volts, to the various transforming stations, which are located at Niagara, Thorold and St. Catharines, where it is stepped down to 600 volts, direct current. To supply the recent extension to Port Colborne the high tension system is being extended to Welland and work on the sub-station there is in progress. The new lines along the Niagara river and Lake Erie shore will also be supplied by a high tension power line from the power house at Niagara Falls. This power line will supply a sub-station at Fort Erie and it is also probable another sub-station will be located at Crystal Beach, which will feed the railway lines east toward Fort Erie and west to Port Colborne. The transmission lines throughout parallel the railway lines and will occupy the same right of way.

New Rolling Stock.

It has always been the policy of the management to maintain the rolling stock in a high state of efficiency, and it is promised that the new equipment to be used on the 1910 extensions will be of the very highest standard of workmanship and modern engineering skill. The contracts for the new rolling stock have not yet been awarded, but this matter will be taken up as soon as work on the Port Colborne to Fort Erie extension is commenced. As stated above, the traffic between Crystal Beach and Fort Erie is expected to be unusually heavy, and on this part of the line especially the management are preparing their plans for its accommodation with unusual thoroughness.

The Management.

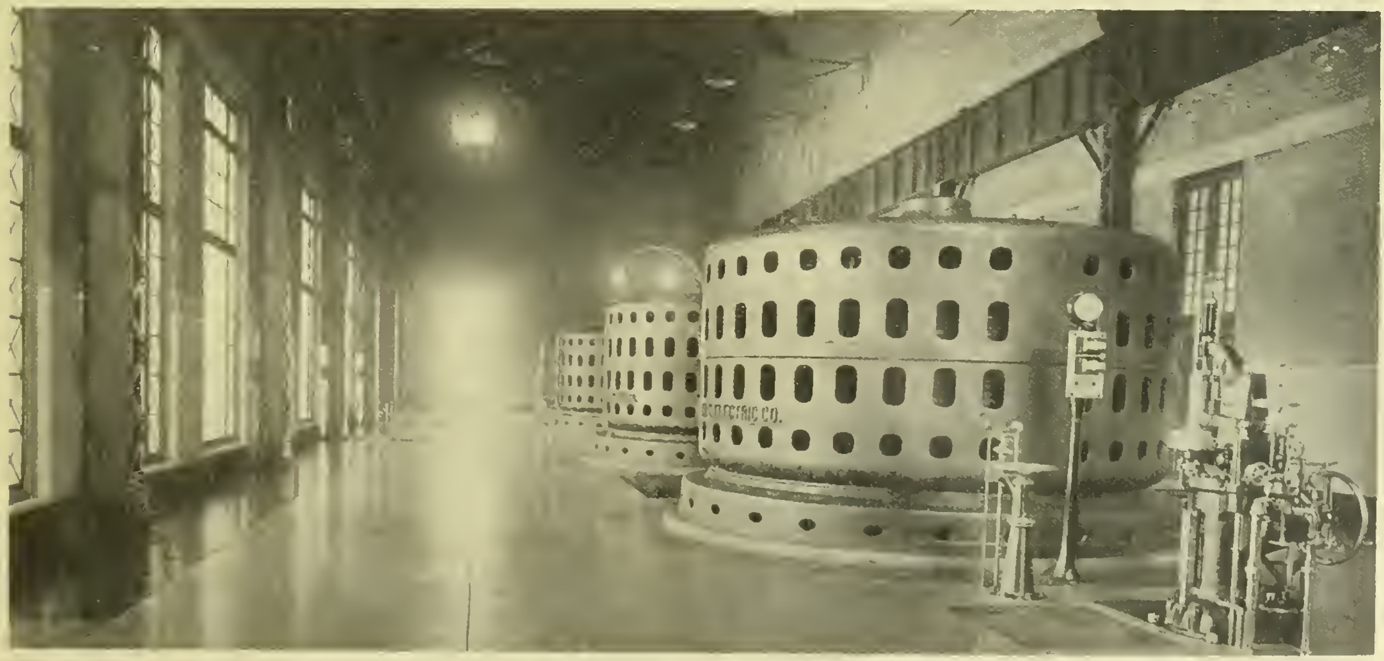
The president of the company is D. B. Hanna, and the directorate includes such well-known names as J. D. Morton, vice-present; Frederic Nicholls, E. R. Wood, Z. A. Lash, Aemilius Jarvis. The secretary-treasurer is A. J. Mitchell. The entire operating system is under the capable management of E. F. Seixas, located at St. Catharines, ably assisted by W. R. Robertson, as superintendent, and W. P. Chapman, chief engineer.

Toronto Power Co. Making Large Additions

A CanadianEnterprise Well Managed Present Installation Outlined—Adding Forty-eight Thousand Horse Power to Capacity

The recent announcement of Manager Fleming of the Toronto Power Company that contracts have been awarded for the installation of three large power units at the generating station, Niagara Falls, is ample reason, if any such is needed, for calling attention to a number of points of excellence in this plant and of reproducing a couple of new photographs which emphasize these facts perhaps better than words can do.

Niagara Falls, even in its primitive condition, was one of the most entrancing places in the world. It is true there are those who claim to believe that the present period of power activity



Four 16,000 H. P. Generators of Toronto Power Company's Developing Plant

The Beautiful Home of the Toronto Power Company's Generating Plant

reduces the attractiveness of the locality, but it is safe, we believe, to say that there are few who do not see in all this skillful activity an added beauty. Before, it was an art display with only one lone picture in the centre of the gallery; now, in addition, the walls are hung with a half dozen such pictures that, compared with any age, or with any country, they are masterpieces.

And so it is no reflection on the others to claim, and it ought to be a matter of congratulation on the part of all Canadians to be able to claim that the Canadian plant, conceived by Canadians, constructed for the most part by Canadians, financed by Canadians, owned and controlled by Canadians, installed wherever possible with Canadian machinery, and now successfully operated by Canadians, is a little bit superior to the rest of the group; in its more favorable location; in its absolute solidarity of construction; in the hight efficiency of its various units; in the unusual factor of safety provided at every point; in its continuity of service; in its beautiful exterior. And it is only right that we should render homage where it is due to the artists, to Nicholls and Pellatt and Plummer and Macrae, to Pearson and Value and Cooper, as well as the present guardians of the treasure, to Fleming and Boyd.

The Present Installation.

The extent and description of the present installation of four units are too well known to require any detailed remarks. The plant is located above the falls some 2,000 feet. The water passes from an ample forebay down 10 1-2 foot metal pipes, to turbines installed in the bottom of an ample wheel pit, 26 feet wide by 150 feet deep. The turbines are double runners of I. P. Morris manufacture, each pair having a capacity of 13,500 h.p. They are direct connected by vertical shafts, 136 feet long, to Canadian General Electric generators of 8,000 kw. capacity each, which have demonstrated time and again an overload capacity up to 12,000 kw. The total present normal capacity is thus 32,000 kw., capable at overload of generating 48,000 kw.

The Additions.

The charter of the Electrical Development Company calls for a final development of 110,000 h.p. and, along with the installation of the first four generators, much advance work was done looking to the early addition of more units. For example, the wheelpit has been excavated throughout its whole length, sufficient to accommodate eleven units; the forebay is also complete and the power house itself will accommodate three more units before any additions are necessary, in other words, the centre section and one wing of the building is now standing, as shown in the photograph, and it will only require the other wing to complete the plan. The installation of the three new units then, will involve practically no expense or delay other than that entailed in their manufacture and assembling.

The new generators are also Canadian General Electric manufacture, and it is claimed will be the largest in existence. The normal capacity of each will be 8,000 kw. with a guaranteed overload capacity of 50 per cent., making 12,000 kw. or 16,000 horse-power. The generators are of the stationary armature revolving field type, 3 phase, 25 cycle, 250 r.p.m., 12,000 volts. The approximate weight of rotor and shaft is 170,000 lbs., and of the stator 230,000 lbs. Total weight of generator 215 tons. It is expected the first generator, No. 5, will be in operation by February 1, 1911, and that the other two, Nos. 6 and 7, will be installed within that year.

The turbines will be double runner inward and parallel flow discharge, I. P. Morris manufacture, 250 r.p.m. Under an effective head of 130 feet the turbines will have a capacity 15,000 h.p. each at .95 full gate.

Mr. Lawford Grant, Canadian Secretary of the Institute of Electrical Engineers, London, England, has been officially notified that diplomas of full membership in the Society have been granted to Messrs. P. W. Sothman, Toronto; R. S. Kelsch, Montreal; and Prof. L. A. Herdt, McGill University.

Montreal and Eastern Canada Progress

Extensive developments reported from our Montreal Office — Quebec's Merger plans well advanced—Sherbrooke Railway Company will develop water power

Regina's Street Railway Franchise.

The City of Regina is at the present time considering an application for franchise rights, to operate an electric railway system within the corporation limits. The new project is interesting to Montrealers in that Mr. Lawford Grant, president and general manager of the Canadian British Insulated Company, is the leading spirit in the promotion of the enterprise.

The new company on the granting of a charter propose to proceed immediately with the construction of eight miles of track and to operate a most modern electric railway system. It is the intention to purchase their operating power from the municipal electric company at the rate of 1 1-2 cents per kilowatt, thus giving the corporation plant the benefit of an assured day load.

The company expect to arrange for a thirty-year operating franchise, and on this score should meet with but little opposition from the municipality. The present population of Regina is placed by Bradstreets at 10,000, and it will be a number of years before the street railway proposition can be placed upon a paying basis.

We understand the new company is composed of a New York syndicate, with ample capital behind it for the carrying out of the present project and, backed by Mr. Grant's extensive business experience, the operation of the new company should be eminently successful if awarded this franchise.

The Dominion Light, Heat & Power Company.

The Dominion Light, Heat & Power Company are making excellent progress with the installation of their gas producer plant in Maisonneuve and expect to be able to deliver power by the first of May. Already they have completed a pole line quite a distance along St. Catherine street from the Maisonneuve plant, and this district will be the first to receive a supply of electric power. Mr. L. G. Read, general manager of the company, states that within a short time they hope to supply power throughout the city from a number of distributed power stations. Mr. J. M. Robertson, Board of Trade Building, is their consulting engineer.

Wire & Cable Company's Large Contracts.

The Wire & Cable Company were recently awarded a large contract by the Manitoba Government for the requirements of cable and rubber-covered and bare wires for the equipment of their provincial telephone system. A similar contract was recently closed with the Government of Alberta for the same purpose, while a short time ago a large contract for bare wire was received from the Saskatchewan Government.

The Wire & Cable Company report an excellent Eastern trade and, with the large additional contracts from the West, are finding it necessary to keep a night and day staff constantly employed.

Canadian Branch of International Electro-Technical Commission.

At a recent council meeting of the Canadian Society of Civil Engineers action was taken in the matter of naming members to form a Canadian branch of the International Electro-Technical Commission. Prof. L. A. Herdt, of McGill University, was elected chairman; Mr. O. Higman, Ottawa, secretary; with Prof. T. R. Rosebrugh, Toronto University; Prof. L. W. Hill, Queen's University, Dr. H. B. Barnes, McGill University, and Messrs. John Murphy, of Ottawa; A. B. Lambe, Canadian General Electric Company, Winnipeg, and W. A. Duff, Canadian Westinghouse Company, Winnipeg, as fellow members.

The organization of an International Electro-Technical Commission was the direct result of a resolution passed by the St. Louis Congress held in 1904, which advocated the co-operation of technical societies for the purpose of standardizing the nomenclature and ratings of electrical apparatus and machinery. In June, 1906, an inaugural meeting of the International Electro-Technical Commission was held in London, England, with representatives present from a large number of interested countries. Prof. Herdt, of McGill University, was one of the Canadian representatives at this important convention. Considerable progress was made in standardizing and adjusting electrical terms and it was also decided that each technical society in the various countries should appoint a committee to continue the work as outlined at the first meeting. The formation of the present committee, by the Canadian Society of Civil Engineers, is the first move that has been made in Canada in this direction, but it is now expected that the committee just appointed will get together and will have an interesting report to make in the near future.

Electrical Association, Province of Quebec.

A deputation, consisting of the members of the executive committee of the Electrical Association, Province of Quebec, waited upon the Board of Control recently and made the request that either the wiring inspection certificates, issued by the Canadian Fire Underwriters' Association be officially accepted by the city or in the event of the city appointing an inspector and establishing a bureau of inspection, that their certificates be accepted as final by the Underwriters' Association. It was further requested that the lighting companies be compelled to recognize the certificates adopted and to connect services only where such certificates were produced.

The electrical deputation was courteously received by the civic legislators, and there is every reason to believe that the wishes of the Electrical Association will be consulted before any radical changes are made.

Canadian British Insulated Company.

This company within the last few days has been awarded some very substantial contracts. One, with the City of Toronto, calls for the supply of the whole of the high and low tension cables which will be required during the year 1910, amounting to about $50,000; another is in connection with a section of 25,000 volt submarine cable for the Kaministiquia Power Company at Kakabeka Falls, this order being placed through R. S. Kelsch, consulting engineer for the development company, and W. L. Bird, its general manager. A third contract similar to the latter has also been entered into with the City of Three Rivers.

The Sherbrooke Railway & Power Company.

A charter has just been granted to the Sherbrooke Railway & Power Company, who purpose to extend the existing electric street railway system in the city of Sherbrooke and to develop the water power on the Magog river. The present street railway was constructed about seven years ago on a small scale and has never been extended or improved to meet the growing requirements of the city, the population of which at the present time has reached seventeen thousand. Sherbrooke is the third city in the Province of Quebec in point of size and is rapidly growing in importance as a railway centre, and a population of 25,000 or more can reasonably be expected within a very few years. The Magog river, which will be developed to furnish electrical power, flows through the centre of the city and has as a basin Lake Memphremagog. Messrs. Ross & Holgate, consulting electrical engineers, investigated the proposition for the new company and as a result of their report an initial development of from three to four thousand horse-power will be proceeded with immediately. We understand that it is the company's intention to extend their railway system to Windsor Mills, Magog, Bromptonville, Lennoxville, North Hatley, and

Little Magog Lake, forming in this manner an extensive interurban system. Power will also be supplied to industrial companies within a radius of twenty-five miles. The new company is composed of a syndicate of Montreal capitalists, and Messrs. Frank Thomson & Company, with McCuaig Brothers & Company, are largely interested in the organization work. It is also understood that the same interests will be associated with this new development as were recently identified with the successful flotation of the Mexican Northern Power Company, Limited.

Quebec Railway, Light, Heat & Power Company.

Progress continues to be made toward the consolidation of all the electrical interests concerned in the big Quebec merger. All the offices of the merged companies, as they existed under the old regime, have been closed and the business of the new company centered at the head office at Quebec.

At a recent meeting of the shareholders the following board of directors was appointed: Mr. Rodolphe Forget, M.P., Montreal, president; Mr. Lorne C. Webster, Quebec, vice-president; Mr. Neuville Belleau, Quebec, chairman of the executive; Messrs. the Hon. Robert Mackay; the Hon. J. P. B. Casgrain, Montreal; the Hon. E. B. Garneau, L.C.; the Hon. C. E. Dubord, L.C.; and the Hon. L. P. Pelletier, K.C., Quebec; J. N. Greenshields, K.C., Paul Galibert, J. W. McConnell, A. H. Sims, S. H. Ewing and W. G. Ross, Montreal, and W. A. Marsh, Quebec.

New Power Company to Operate in Quebec.

The United Manufacturing Company, capitalized at $45,000, are applying through their solicitors, Messrs. Vipond & Vipond, of Montreal, for a Quebec charter of incorporation.

The company propose to develop electrical power on the St. Maurice river and to transmit and distribute this power within the Counties of Champlain, St. Maurice, Maskinonge, Berthier, Joliette, Montcalm, L'Assomption, Terrebonne, Laval and Hochelaga. We understand that negotiations are also under way whereby this same company will develop other extensive water powers.

The personnel of the new company has not yet been disclosed, but several Montreal financial men are said to be interested.

Current Notes

Mr. Medbury, manager of the Montreal district for the Canadian Westinghouse Company, Limited, is moving with his office staff to more commodious quarters in the Victoria Building. The change will take place in April and will enable the company to have their offices and warehouses located in the same building.

Mr. Guy M. Gest, electrical engineer, New York and Cincinnati, has opened a Canadian office in the Power Building, with Mr. C. Masson in charge.

Mr. J. E. Ryan, formerly sales manager of the Montreal district for the Packard Electric Company, Limited, of St. Catharines, recently joined the sales staff of the Canadian Crocker-Wheeler Company, Limited.

The Engineering Equipment & Supply Company, 410 St. James street, will supply flame arc lamps for lighting the Automobile Show, which will be held in Montreal at the Coliseum, from March 26th to April 2nd.

Mr. H. D. Bayne sailed from New York on March 3rd on an extended business trip to the Continent and expects to return by way of England. Mr. Bayne's trip will include a visit to the head office of the General Electrical Manufacturing Company of Sweden. During his absence his office at 11 St. Sacrament street, Montreal, is in charge of his sales engineers.

Messrs. Vessot & Company, of Joliette, Que., have completed arrangements for the installation of a water power plant in that town. The Canadian Fairbanks Company, Limited, will supply one 60 k.v.a., three phase, 230 volt alternator, and have the contract for the complete electrical installation, which includes the erection of power and lighting circuits, and a telephone system. The Vessot Company expect to supply power for factory loads and also for a residential and street lighting system.

Mr. Wm. J. O'Leary & Company, electrical engineers, Montreal, are installing the power and lighting system for the Jacobs Asbestos Mining Company of Thetford, Limited, Thetford, Que. Motors aggregating 2,200 horse-power are being installed.

Mr. Gordon Greenshields has been appointed manager of the Black Lake Consolidated Asbestos Company, of Black Lake, Que.

Building Inspector Chausse has recommended in a report to the Board of Control of Montreal, the appointment of an electrical inspector to assist him in improving the city's building inspection system.

Mr. Leo J. Denis, formerly chief engineer and electrician of the Quebec-Jacques Cartier Electric Company, has been appointed electrical engineer of the Commission for the Conservation of Natural Resources. His duties will embody the supplying of a report on the value of water powers throughout the country.

The Robertson Asbestos Company, of Robertson, Que., have recently ordered one 150 h.p., two 100 h.p., and one 75 h.p. three phase motors from the Allis-Chalmers-Bullock, Limited.

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We are informed of Mr. M. A. Sammett's appointment as consulting engineer of the Amalgamated Asbestos Corporation, Limited. Mr. Sammett was identified for the past few years with the different mining companies, recently merged into the Amalgamated Asbestos Corporation, and his appointment is taken as a recognition of his services with the individual companies. The new corporation is making large extensions to the mines and mill equipments. Orders have just been closed with the Canadian Westinghouse Company, Canadian General Electric Company, and the Allis-Chalmers-Bullock Company for electrical apparatus.

Removal Announcement

C. W. Bongard Company, Limited, manufacturers and dealers in electrical supplies, are now located in their new home at 70 King street west, Toronto, which they have handsomely fitted up. They have excellent warehouse and shipping facilities and are now in a better position than ever to take prompt care of the requirements of their clients.

Increasing business demanded not only larger quarters but an increase in the office and sales staff of the company. Mr. C. W. Bongard is president, Mr. Frank Scofield general manager, Mr. C. H. L. Keeler sales manager, and Mr. J. A. Johnston assistant sales manager. Mr. Scofield, who recently joined forces with this company, is no stranger to the electrical fraternity in Canada. He was formerly general manager of the Bossert Electrical Construction Company of Utica, N.Y. Mr. Keeler and Mr. Johnston are both well known and experienced electrical men. The company is, therefore, strong in both the executive and sales departments.

Vancouver and Western Provinces

Lethbridge New Lighting Plant—Remarkable Recovery of Fernie—Good Progress on Jordan River — Hydro-Electric Development for Cranbrook

Lethbridge Municipal Lighting Plant.

The following particulars concerning the new electric lighting plant recently installed by the city of Lethbridge, Alta., to replace the service destroyed by fire some time ago, will be of interest to our readers.

The old plant contained two engines and generators of 450 k.w. capacity, and one 200 h. p. Babcock & Wilcox water tube boiler that it was intended to move to the new station, but as those have been completely destroyed they must be replaced. The new station is about 85 feet square and is thoroughly fireproof, being constructed of concrete brick and steel, with cement floors and roof. The engine room is equipped with a 350 k.w. engine and generator; the engine is a high speed vertical made by Belliss & Morcom, of Birminghag, England, and runs at 360 r.p.m.; the generator by the Canadian Westinghouse Company, Hamilton, who are also supplying a 30 k.w. motor generator exciter set and main switchboard. They have on order at present a 500 k.w. engine and generator by the same makers to replace those destroyed in the old station. In the basement of the engine room are located the condensers, air and circulating pumps, all by Belliss & Morcom, of Birmingham, also a 2,000,000 gallons per day Worthington horizontal high duty pumping engine. Current is generated at 2,200 volts, 2-phase, 60-cycle, and secondary current is 220-110.

The new station is situated on the flats adjoining the river, and coal is supplied direct from the city's own mine situated about 1,200 feet from the station, at a cost of approximately $2.50 per ton.

The plant is a municipal enterprise owned and operated by the city of Lethbridge and under the direct supervision of the superintendent engineer, Mr. Arthur Reid.

There is also an inspection department, in charge of the city electrician, where the "Code" has been adopted as the standard. The electrical contractors, too, are co-operating to maintain a high standard of wiring throughout the city.

City of Fernie Municipal Light Plant.

After the disastrous fire of August 1st, 1908, the city of Fernie, B.C., entered into negotiations with the Crow's Nest Pass Electric Light & Power Company, (which company formerly operated the light plant in Fernie) with a view of starting a municipal light plant. These negotiations after some months were concluded, and the city acquired the power house machinery, formerly owned by the old light company.

The plant purchased consisted of one Robb Armstrong side crank, 20 by 20 engine, and two S. K. C. 2-phase, 60-cycle, 2400-volt alternators. The city then called for tenders for the construction of a 100 by 75 foot concrete power house, and for the installation of a complete boiler plant, pole line and street lighting system. The former contract was let to Mr. John Wood, and the latter to the Depew, Macdonald & McLean Company, of this city. Mr. H. H. Depew resigned his position as general superintendent of the Crow's Nest Pass Light & Power Company in order to form an engineering company to tender on the building of this plant. The new company were the succesful tenderers, and deserve great credit for the efficient manner in which they fulfilled their contract.

The boiler is at present equipped with three 150 h.p. Robb return, tubular boilers, Wainwright heater, blower, etc. The distributing system is approximately five miles long and is of standard construction. The main feeders from the power house are 4-wire, 2-phase, No. 2 gauge, and run to several centres on the principal avenues of the city. The secondary feeders are No. 4 and No. 6 gauge and run each way along the avenues, the principal avenues having a 2-phase system to allow for future motor loads. Thirty-five Westinghouse transformers are at present installed, feeding a 3-wire, No. 4 gauge, 220-110 volt system. The street lighting system consists of a Westinghouse 25, arcs regulator in the power house, and Westinghouse 6.6 ampere series arc on 20-foot mast arms at the prinicipal street corners. In the outlying districts Tungsten lamps on 6-foot goosenecks are used.

Light Rate.—

Fifteen cents per kilowatt hour, subject to the following discounts:

20——50 kilowatts per month, 10 per cent. discount.
51——100 kilowatts per month, 15 per cent. discount.
101——250 kilowatts per month, 20 per cent. discount.
251——350 kilowatts per month, 25 per cent. discount.
351——500 kilowatts per month, 30 per cent. discount.
501——750 kilowatts per month, 40 per cent. discount.
751——1000 kilowatts per month, 45 per cent. discount.

Power Rate.—

Fixed rate, $1.00 per month per horse-power of motor capacity. Ten cents per k.w. hour, subject to the following discounts:

Up to 50 kilowatts per month, 5 per cent. discount.
Up to 500 killowatts per month, 10 per cent. discount.
Up to 1000 kilowatts per month, 20 per cent. discount.
Up to 2500 kilowatts per month, 3 per cent. discount.
Up to 5000 kilowatts per month, 4 per cent. discount.

Mr. R. B. C. Hammond, the present superintendent of the plant, who formerly was electrician for the Crow's Nest Pass Coal Company for a number of years, deserves great credit for his able management of the new plant, which is now on a paying basis.

The municipality, following Mr. Hammond's advice, are contemplating in the near future the installation of a more economical plant, and several propositions are under consideration. One is the development of a large 15,000 h.p. hydro-electric generation at Elko and failing this, the installation of compound condensing engines and more economical generators than are in use at present.

High and Low Tension Systems.

A large number of the members of the Vancouver, B.C., Electric Company section of the National Electric Light Association listened recently to a most interesting adress by Mr. Kennedy on "High and Low Tension Distributing Systems." In his opening remarks the speaker referred to the astonishing progress made within recent years in transmitting current to long distances under high voltage. Until a few years ago, it was considered a notable feat of engineering to transmit current a distance of ten or twelve miles at a pressure of 10,000 volts, while to-day the limit, if any exists, is not known, for the reason that no transmission system has as yet found distance any obstacle from an engineering standpoint. The usual voltage on these lines to-day is 50,000 to 100,000 volts, and there is not any serious difficulty in the way of increasing this pressure and so effecting a great saving in the amount of copper required. Mr Kennedy next referred to the B. C. E. Railway's system, explaining the manner of dividing the total current produced at Lake Buntzen power house into different circuits and sending it out to the various sub-stations, from which it was distributed after being transformed to a voltage suitable for light and power and traction.

Vancouver-Seattle Electric Line.

There appears to be a strong possibility that within the next couple of years the cities of Vancouver and New Westminster may be connected up with Seattle and other Puget Sound points by electric line. Some prominent electric railway men are working on the scheme and are likely to secure the required capital, as the proposed line would traverse some of the richest portions of British Columbia and Washington State, and would undoubtely prove a paying proposition from its inception. The Stone and Webster interests in Washington State, and their new line to Everett is thought to be a link in the proposed Vancouver line. The same company also owns the Seattle-Tacoma interurban, and is planning to extend to Grays Harbor and on to Portland. It is believed an arrangement is likely to be made with the British Columbia Electric Railway to construct and operate the line to the junctoin point at the border.

Electric Power Generation Near Cranbrook.

Barely twenty miles from the busy town of Cranbrook, B.C., there is in course of construction a hydro-electric power station that should be in operation within the next six months, supplying at least 10,000 horse power to industrial concerns within the district tributary to it, and which is calculated to exercise a very important influence in the industrial development of that section of the province.

Some five years ago, Mr. George E. Henderson, of Canton, South Dakota, had his attention drawn to the Bull river section by a former Cranbrook resident. Mr. Henderson came up to British Columbia, investigated the Bull river power possibilities, became imbued with the idea that the development of this power would be a big and profitable undertaking, and forthwith, with characteristic American push, got busy, interesting friends in Dakota and Wisconsin in the proposition. He found the capital to start operations and in short order work was commenced on what promises to be one of the most important electric power stations in Southern British Columbia.

The construction of the flume has taken a long time, but it is now nearing completion. The flume is one and three-quarter miles in length, sixteen feet wide and seven and a half feet deep inside. A Minneapolis expert called in to report upon the property, with particular reference to the available water power, gave it as his opinion that the Bull river falls offered the best power he had seen. This is a verdict concurred in by many other power experts who have examined the property.

So far upwards of $200,000 has been expended, but by the time the electrical plant is installed the company expect to have invested fully $750,000, and what is very encouraging, they have not the slightest doubt but what they have invested wisely. From the outset they will be in a position to supply 10,000 horsepower, and they have good reason to believe that the demand will be equal to the supply. As a matter of fact, when Mr. Henderson first conceived the idea of turning the Bull river falls to commercial account, there was little or no demand for motive power in that section, although the probabilities for a demand looked good to him. In the interval, practically five years, Mr. Henderson has seen the demand for motive power reach the high total of 23,000 horsepower, and practically speaking, only a start has been made in the industrial development that is bound to make the Crow's Nest section one of the busiest in North America. The plant is very centrally located to distribute power throughout the Crow's Nest section. It is but twenty miles from Cranbrook, and fifteen from Fernie. These are facts that the Cranbrook Board of Trade should take to heart.

The Bull River Electric Power Company, as previously indicated, is purely an American enterprise, the capital all being subscribed by South Dakota, Wisconsin and Illinois people. George E. Henderson, the resident manager, is president of the company, and he hails from Canton, South Dakota. The directors include C. E. Heckmaster, of Canton, S. D., Jas. Anderson, of the same place, Dr. Porte Crego, of Aurora, Illinois, and Bert. E. Crego, of the same place. D. G. Guinter, of Canton, S. D., is the secretary.

General News Items.

The stack or chimney being built in connection with the new steam auxiliary plant for the British Columbia Electric Railway Company, at the foot of Barnard street Vancouver, will be among the highest in the Dominion. It is being constructed of reinforced concrete and will tower to a height of 246 feet from the ground. The internal dimension will be 11 feet throughout and for a considerable height the chimney will have double walls with air space between in order to prevent excessive heat.

Good progress is being made by the B. C. Electric Railway Company on the preliminary work in connection with the installation of the new power plant at Jordan River, Vancouver Island. A force of 120 men are at work clearing the site for the power house, building flumes and pipe lines and laying a track to carry supplies to the workers.

Extensive repairs will have to be made on the lighting system of Granville street bridge Vancouver, opened last summer by Earl Grey. At a recent session of the Bridge committee of the Council, City Electrician McCrossan reported that the wires on the north end of the structure, including those operating the draw, had broken because of faulty construction, insufficient insulation and inferior transmission for the voltage to be carried. He will report upon the cost of reconstruction of the whole bridge circuit.

City Electrician McCrossan of Vancouver

The International Contract Company, of Seattle, has been awarded a contract by the British Columbia Electric Railway Company for the erection of two steel transmission towers for carrying the high power wires of the company across the Fraser river at the New Westminster bridge. The towers will be 190 feet above high water mark in order to clear the tops of the masts of the largest ocean vessels ascending the river to load at the docks of the Fraser River Lumber Company or Brunette Mills. The Canada Foundry Company, of Toronto, is supplying the steel, six carloads of which arrived recently.

At the last meeting of Kamloops City Council, Consulting Engineer Dutcher's report on the Shuswap Power Company's proposals was received. This set forth that the present cost to the city for pumping is 3 1-2 cents per k.w. hour, and for the lighting plant 4 1-2 cents per k.w. hour. He suggested that if any arrangement is made with the Shuswap Power Company the contracts should be for not less than five years.

The Kootenay Telephone Lines, Limited, of Cranbrook, recently completed a new line from that city to the Crow's Nest Pass Lumber Company's new mill at Galloway. This puts the Kootenay telephone lines in touch with nearly every lumber mill and camp in southeast Kootenay. The company expect to have connection through all West Kootenay points, Washington and Idaho, via Spokane, thus giving a through service to all points in East and West Kootenay and Alberta.

Mr. W. H. Elson, for twenty-three years connected with the Canadian Pacific Railway as conductor and trainmaster, has been appointed trainmaster of the B. C. E. R., a new office which has just been created by the management. He will have charge of all matters connected with the rolling stock on the New Westminster, Lulu Island and North Arm interurban lines.

The Prince Rupert Telephone Company has decided upon the installation of the Dean Automatic System, from Elyria, Ohio, and will proceed to business at once, $10,000 being immediately available.

Lighting Conditions in Various Cities

Valuable Descriptions by an Impartial Observer—Tungsten Post Lighting Very Artistic—Magnetite Arcs More Efficient for Streets

Mr. F. A. Cambridge, city electrician of Winnipeg, who recently made a somewhat extended tour with a view to observing various street lighting equipments at typical points in the United States, has issued a valuable summary of his investigations, extracts from which are printed below.

Mr. Cambridge's remarks as to the efficiencies of the various systems examined will be found of value to many Canadian cities and towns who have under discussion the improvement of their own lighting conditions.

Chicago.—A very complex system exists here. The extensive park and boulevard systems are lighted by the park commissioners—system used being 7 1-2 amp. a.c. enclosed arc lamps. With exceptions of the most recent installation on the Lincoln Park boulevards the lamps are hung from iron poles and are all fed from underground wires. The recent installation in Lincoln Park consists of 300 reinforced concrete posts of a reddish tinge resembling granite, about 12 feet in height surmounted by a 20 inch globe. The globes, which are composed of a special glass termed "Alba," entirely enclose the lamp and its mechanism. The appearance both by day and night is artistic, and appears to be more in keeping with the surroundings than an iron post would be. The lamps are spaced about 125 feet apart on both sides of the boulevards. In the city proper, open arcs are used in the centre districts, and 7 1-2 amp. a.c. enclosed in the outlying districts. The lighting of the main business streets is wretched. It is estimated that 17,000 additional arc lamps will be required to properly light the city, involving an estimated expenditure of $2,305,000.

The merchants in some districts have at their own expense erected ornamental tungsten posts. Through the courtesy of the Commonwealth Edison officials, I was driven out to the southwest portion of the city and saw several installations of these posts in service. The whole cost is assessed on the property benefitted, and collected by the company. The merchants are said to be well pleased with the results.

Detroit.—The entire street lighting system is owned and operated by the city, about 4,500 lamps being in use. Detroit is considered a well lighted city, but they are at the present time installing 1,400 four ampere luminous arc lamps, displacing the 7.5 ampere a.c. enclosed arc lamps formerly used; these in turn are to replace open arc lamps in the suburbs. At the time of my visit, most of the station apparatus had been installed, and several of the principal streets were lighted by the new lamps. On Woodward avenue and some of the more important intersections, double lamp posts are used. The spacing is somewhat irregular, but would average about 125 feet. Clear glass globes are used, and the illumination is very satisfactory. The whole cost of both installation and operation is borne by the city.

St. Louis.—There are two installations of luminous arc lamps installed by the General Electric Company within the past two or three months. One on Broadway, consisting of 240 4-ampere lamps, the other on various other streets in the more congested business district, consisting of 427 lamps operating at 6.8 amperes. The Broadway arrangement consists of three lamps on each post, spaced about 60 feet apart, on each side of the street, which is about 75 feet wide. The balance of the district outside Broadway is lighted by the 6.8 ampere lamps, one on each post, spaced usually about 80 feet apart, though owing to the arrangement of lamps on cross streets, four lamps are worked in at the intersections. These streets vary in width, but run about 60 feet, with the exception of twelfth street, which is 116 feet wide. I consider the Broadway scheme too garish—the illumination was excessive. The other streets, lighted by a single 6.8 ampere lamp, were what one would call well lighted. It was possible to read small print at any point on the street. All globes were of clear glass, and from photo you will have an idea of the style of post (see Fig.) The entire cost of the installation of the posts, amounting to about $40,000, was borne by the property owners—the cost working out to about $1 per foot frontage.

Style of Post Used in St. Louis

Garry, Ind.—I also saw here a unique installation, consisting of tungsten posts on each side of the street, with centre trolley poles carrying 6.6 ampere a.c. enclosed arc lamps. The great difference existing in the color of the two illuminants, however, detracted from its appearance.

St. Paul is still operating carbon lamps on the ornamental iron posts, the resulting illumination being poor compared with tungsten lamps, and inefficient.

Minneapolis.—The tungsten post lighting system is used. This consists of several hundred ornamental iron posts of same design as those installed on Portage avenue, Winnipeg. While the appearance by day or by night is highly pleasing, the illumination is to my mind unsatisfactory. It is, however, a great improvement over the old open arc lighting which formerly obtained in that city, and for that reason has given general satisfaction.

In this city I inspected an installation that has been put in by the local lighting company in order to demonstrate the value of three different types of lamps, the city being about to enter into a new contract for street lighting. These consisted of two installations of Westinghouse metallic flame arc lamps of 4 ampere and 6.6 ampere, respectively, and a General Electric 6.6 ampere luminous arc lamp installation. The apparatus is installed in a temporary sub-station in the outskirts, and the various types of lamps are hung on parallel streets, so that a good chance is given to compare results. I also understand some further experiments are to be made with the "titanium" arc lamp in the near future. From observation of the above lamps in service, I would conclude that the statement made that the illumination given by the 6.6 ampere lamp is about three times that of the four ampere lamp is not very much overdrawn. The greatest difference is noticed half way between lamps. The Minneapolis lamps being installed in a residence district and spaced, I should judge, about 300 or 400 feet apart, afforded information of value that could not be obtained in either St. Louis or Detroit.

As a result of his investigations, Mr. Cambridge has made the following recommendations to the city council:—

(1) The erection of poles of ornamental design, placed from 100 to 150 feet apart on each side of Main street from the C. P. R. subway to the Assiniboine river, and on Portage avenue from Main street to Sherbrooke street, each pole to carry two 6.6 ampere magnetite lamps;

(2) On Notre Dame avenue, a much narrower street, between Portage and Charlotte, the same pole arrangement, each pole to carry only one lamp;

(3) The supplementing of the proposed plan at the intersection of Main street and Portage avenue by arranging for an "isle of safety" with ornamental pole carrying six powerful arc lamps, the congestion of traffic at this point demanding a high degree of illumination.

Future Telephone Service by Meter

Present Method of Charging Unfair—Measured Service Rates in Larger U. S. Cities—A New Meter System Described

By Francis Dagger

In the evolution of the telephone art, probably no branch of the business has received so little consideration as that relating to the method of charging for telephone service. In the earlier stages of telephone delevopment the system of charging a flat rate per year for unlimited service was adopted, and with the exception of a few of the world's largest cities, this method still prevails. In recent years experience has taught that a flat rate is impracticable in large exchanges, for the reason that an unlimited service places upon the telephone company the burden of handling a large percentage of traffic, comprising frivolous and unnecessary calls which have no value to the subscriber, but which nevertheless require a considerable increase in the operating staff to handle. In order to provide an unlimited service under these conditions it would necessitate the charging of a flat rate which would be prohibitive to a large proportion of telephone users. To overcome this difficulty the measured service rate was adopted by companies operating in the larger cities. Under this system a charge of a few cents is made for each outgoing call, plus a small fixed annual payment. While this method is fairly satisfactory to the telephone company, it cannot be said to provide equitable treatment to subscribers, for the reason, to use one illustration, a talkative person could occupy a circuit for half an hour for the payment of one fee, say five cents, while in the same period a business man might make a dozen calls for which he would be charged sixty cents. When it is remembered that a large percentage of the calls in large cities are between two exchanges and entail the occupancy of a trunk line in addition to the two subscribers' circuits, this disparity while being unfair to the subscriber whose conversations are brief, is also a serious matter to the company which is expected to provide adequate trunking facilities between its exchanges to meet all traffic contingencies. The measured rate has eliminated the frivolous and unnecessary call, but it does not furnish any relief from the idle gossiper who can hold up miles of trunk circuit and occupy the system for an unlimited period for a payment which is altogether inadequate to the amount of service rendered.

In the light of these facts it would appear that the most rational method of charging for telephone service is one in which the subscriber pays for what he receives in the same manner as at present prevailing in the furnishing of gas and electric light, viz., by meter. Under such a system the time occupied by each conversation would govern the cost of service, and in this way every telephone user would receive equitable treatment in the matter of rates, without the possibility of discrimination of any kind.

At the recent convention of the National Independent Telephone Association in Chicago a system was exhibited by the Telechronometer Company, of Rochester, N.Y., which bids fair to solve the problem of a metered telephone service. The following is a description of this latest development:—

The telechronometer is an instrument which has been planned to perform, and whose practical demonstrations show that it will perform, a service in the telephone field akin to that performed by the watt-hour meter in the electric lighting and power field. Like the watt-hour meter, it is intended for and adapted to the service of both the producer and the consumer, and comprises a simple device to be installed at the subscriber's station, which responds to inaudible variations of the current from the switchboard and is controlled by a clock-actuated generator located at the central office. The clock is an electrically regulated standard instrument, corrected daily.

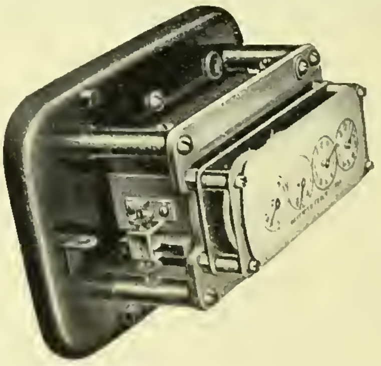


Fig 1—Telephone Meter, Cover Removed

The meter instrument is believed to be the simplest of all instruments used for the measurement of any service. It is only a train of gears, attached to dial pointers, and one moving element directly engaged by a ratchet.

The telechronometer is not affected by elements of use and it is proof against any outside manipulation to arrest its movement. It is controlled by the subscriber's receiver hook-switch and is placed in operation by the completion of the connection with the operator. Its operation is arrested by the replacement of the receiver. It is impossible for a local operator to put up a connection without a charge being automatically recorded.

This system is adapted to installation in existing telephone exchanges, without a change in operating instruments now in use. At the central office, a very slight change in the switchboard will render it immediately operative on the meter basis, and its installation will in no way interfere with continued service on the flat rate instruments not equipped with the meter. The equipment consists of a pair of wires connecting the answering cord battery terminals with a time-controlled motor-generator set. This device operates all of the meters that may be connected with the answering cords, simultaneously. Current changes are produced by energization and de-energization of the field of the generator which, as a result of perfect graduation in rise and fall of the current, is inaudible in the telephone receiver.

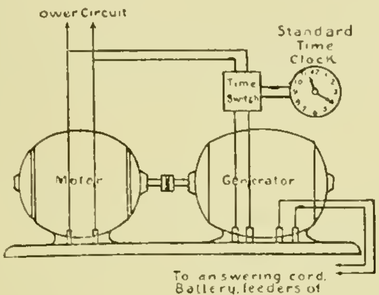


Fig 2—Time Controlled Generator

It is claimed that the expense of operation is an insignificant item, and that the accuracy of the system is one hundred per cent. efficiency. The operation of the system is as follows:—

The subscriber making a call in the usual manner, places the meter in connection by the removal of the receiver. The meter continues to operate its register until the calling subscriber replaces the receiver upon the switch-hook, thereby disconnecting the meter. The units of measurement may be suited to local requirements, but ordinarily one-quarter minute units will answer for local service. By having trunks to nearby cities and towns connected by cords having a more rapidly oscillating source, the traffic can be automatically charged to subscribers on their meters. This method will care for toll traffic and do away with the complicated and expensive ticket auditing system now generally in use.

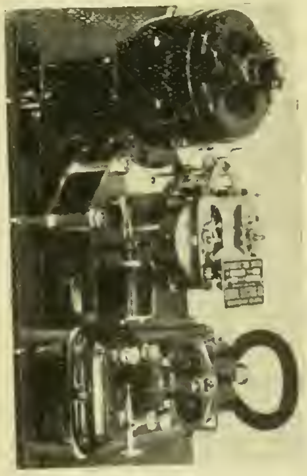


Fig 3—Central Time Switch

The charge is made only on telephones which originate calls or which may be reversed by consent of the receiving party, and as a subscriber can read his meter at all times he has full control of the economy of his service. Where complete equity as between the operating company and the subscriber is thus established, satisfaction to the subscriber and to the operating company must ensue.

The accompanying illustrations will convey a fairly correct idea as to the mechanism of the system:—

Fig. 1 is a reproduction of the simple meter with cover removed and illustrates the compact and simple mechanism.

Fig. 2 illustrates the time-controlled motor-generator set required at the central office.

Fig. 3 illustrates the automatic time switch in the central office.

Fig. 4 shows a case suitable for containing the wall type telephone apparatus, combining a complete telephone meter instrument. (Any manufacturer's standard apparatus may be equipped with these cases).

Fig. 5 illustrates a desk set equipped with meter.

A brief resume of the benefits to be derived from the installation of the telechronometer system from the subscriber's standpoint are:—

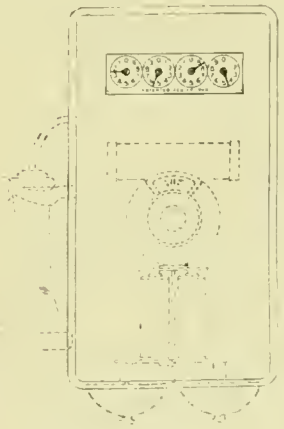


Fig 4—Wall Case

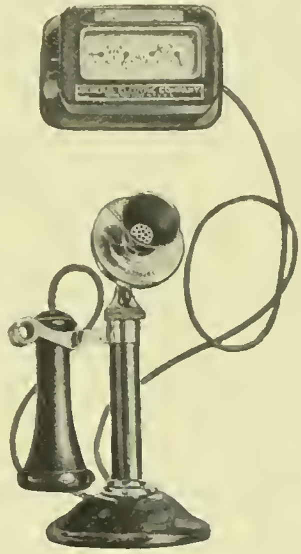


Fig 5—Desk Set With Meter

Absolute equity. Better service.
An enlarged subscribers list.
Elimination of the wasteful use of the service.
Economy of time.

The benefits to the operating companies may be summarized as follows:—

First—Improvement in service through elimination of non-paying users; in other words, elimination of franking privileges to non-subscribers.

Second—Economy by a briefer use of the service by subscribers, thus popularizing party line service.

Third—A popularizing of the party line service will increase capacity of the exchange without a very large increase in investment.

Fourth the adoption of a low minimum and a comparatively high rate per unit of time use, thus increasing very largely and most naturally the number of subscribers.

Fifth—The equity of the system of charging for service will appeal to the masses of users, and this fact will render the service necessary to the larger users who will pay a proportionate rate.

Sixth—The fact that listening on a party line will cost the listener on a metered service as much as it costs the calling party on such line will discourage what is known in the telephone world as "rubbering." In a practical way, therefore, party line service will be protected and rendered more efficient.

It is also claimed that the criticism which sometimes attaches to the water meter, gas meter, and even the watt-hour meter, because of their variableness, cannot attach to this system, because in the case of these other services the meter is seldom readjusted and corrected, and then perhaps only as a result of a complaint form the consumer, whereas the telechronometer, being regulated by a standard telegraphically regulated clock, is automatically corrected every twenty-four hours.

Personal Mention

E. A. James has been appointed town engineer of North Toronto.

E. I. Sifton has resigned his position as city engineer of London, Ont.

D. P. Roberts has been appointed city engineer in London, succeeding E. I. Sifton, resigned.

David Adams, until recently chief operator for the Great North-Western Telegraph Company at London, has been appointed manager, succeeding the late Mr. W. C. Furness.

J. G. Monahan, late of the Canadian Fire Underwriters' Electrical Department, Toronto, has recently joined the staff of Ferranti, Limited, makers of the well-known Ferranti wattmeters and switchboard appliances, for which Mr. Geo. C. Royce is the Canadian representative. Mr. Monahan has just left on an extended business trip.

F. A. Yerbury, Assoc. Mem. Inst. C.E. (Eng.), managing director of the Canadian Boving Company, and A. Aeberli, chief hydraulic engineer, who is well known throughout this continent, have taken temporary offices at the Queen's Hotel, Toronto. The company will have offices in the Lumsden Building, corner Yonge and Richmond streets, as soon as it is ready for occupancy.

Geo. C. Royce, Canadian representative of Ferranti, Limited, left for England on March 12th in connection with matters pertaining to the development of their business in Canada.

S. Beeton, managing director of the brush department of the Morgan Crucible Company, manufacturers of Morganite and Battersea carbon brushes, has been on a short business trip to Canada. Mr. Beeton reports conditions and business prospects very encouraging. The Morgan company's Canadian agents are Vandeleur & Nichols, Toronto.

Joshua Sangster has been appointed general superintendent for the Uncus Power Company, at Scotland, Conn., U.S.A., and in addition will have charge of the substations and high voltage lines. Mr. Sangster is well known in Canada, having been power house superintendent at Power Glen for the Dominion Power & Transmission Company for over ten years. During that period Mr. Sangster saw the capacity of the plant grow from 2,000 to 30,000 kw., and the experience gained in St. Catharines will be a fine asset to the company who has secured his services. The many friends in Hamilton and St. Catharines will be pleased to hear of Mr. Sangster's promotion.

Trade Enquiries

The Dominion Government Trade and Commerce reports contain the following trade enquiries. Readers of the "Electrical News" may obtain the names of enquirers by writing us, enclosing stamped envelope, and stating number of enquiry:

1929. Electric Arc Lamps—A London manufacturing company wishes to get into touch with Canadian firms prepared to introduce their improved electric arc lamps.

1951. Iron and steel goods—A London firm manufacturing sheets, bars, rods, Swedish charcoal iron, transformer sheets, dynamo sheets, blooms for magnets, magnet steel, mild steel castings, stampings for electrical purposes, high speed tool steel, high speed twist drills, bright hexagon nuts, bolts, set screws, saw blades, bright drawn charcoal iron rods, alloy sheet steel for electrical purposes, etc., is desirous of doing business directly with Canadian importers of such goods.

1950. Steam and electric cranes, excavators, steam winches, windlasses, etc.—A London firm manufacturing steam and electric cranes, excavators, steam winches, windlasses, etc., desires to open up business in Canada.

1985. Electric cranes, winches, etc.—A Lancashire firm manufacturing electric cranes, electric winches and lifts makes inquiry for the names of Canadian importers of machinery such as they manufacture.

1998. Plugs, switches and electric regulators—A London company manufacturing plugs and switches of all kinds and electric light regulators is desirous of getting into touch with reliable Canadian firms prepared to push the sale of their goods.

6. Electrical frequency indicators and vibration tachometers—A London firm manufacturing electrical frequency indicators and vibration tachometers wishes to open up Canadian business.

7. Agent—A firm of engineers near London manufacturing a trolley standard earthing device, two blade rail cleaners, tangential suspension for overhead lines, suspension gear for E.H.T. transmission lines, block signalling apparatus, switch gear, etc., for street railways, is desirous of appointing a Canadian agent.

135. **Agency.**—A firm in the west of England manufacturing dynamos and electric motors, etc., desires to appoint a reliable firm to represent them in Canada.

141. **Electrical instruments.**—A Yorkshire firm manufacturing electrical instruments (transformers, balancers, compensators, etc.), is anxious to do business in Canada.

196. **Agent.**—A Swiss company manufacturing electrical plant and equipment, and also specialties in turbines, variable speed motors, rivetters, drilling machines, etc., seek a competent Canadian resident agent to introduce their machinery.

254. **Electrical appliances.**—A North of England firm manufacturing overhead electric cranes, electric jib cranes, electric capstans and winches, electric transporters, etc., is anxious to get into touch with a large manufacturing firm in Canada open to co-operate with them in extending their Canadian business.

257. **Agent.**—A Scottish firm manufacturing electric plant of all descriptions for use in factories, mines, steamships, electricity and gas works, etc., is anxious to appoint an energetic and reliable agent to push the sale of their machinery in Canada.

258. **Agents.**—A London firm manufacturing arc lamps, metal filament lamps, automatic transformer switches, transformers, carbons, globes, reflectors and other accessories, is open to appoint agents at Montreal, Toronto, Ottawa, Winnipeg and in British Columbia.

345. **Electrical frequency indicators.**—A London firm manufacturing electrical frequency indicators and vibration tachometers wish to open up Canadian business.

353. **Agents.**—A Cheshire firm manufacturing electric overhead travelling cranes, electric pulley blocks, electric hoists, electric transporters and electric runways, desire to appoint Canadian agents.

Toronto Offices of Packard Electric Company

The Packard Electric Company have established general sales offices in the Saturday Night Building, Toronto, in charge of their sales manager, Mr. Geo. C. Rough. Mr. W. R. Christie will be attached to this office and will cover the Ontario district on the road.

The announcement in our last issue that Dawson & Company, Limited, Montreal and Winnipeg, the electrical street railway and mill supply house, would remove from their Montreal quarters at 148 McGill street, was an error. It is the Winnipeg supply rooms that will in future occupy 56 Albert street.

QUESTIONS AND ANSWERS

GENERAL RULES TO BE OBSERVED BY CORRESPONDENTS:

1. All enquiries will be answered in the order received, unless special circumstances warrant other action.
2. Questions to be answered in any specified issue, should be in our hands by the close of the month preceding publication.
3. Questions should be confined to subjects of general interest. Those pertaining to the relative value of different makes of apparatus, or which for intelligent treatment, should be placed in the hands of a consulting engineer, cannot be considered in this department.
4. To avoid trouble and unnecessary delay, correspondents should state their questions clearly, so that there can be no possible doubt as to the information required.
5. In all cases the names of our correspondents will be treated confidentially.

To Remedy Vibrating Laminations

Q.—The outside brass plates for holding the laminations pressed together in a stationary armature type of generator have in a few places sprung out at the finger ends, which allows the laminations to vibrate, causing considerable noise. How should I remedy the trouble?

A.—To answer the above question properly an examination of the apparatus would have to be made, and we would, therefore, suggest that you communicate the facts in the case to the maker of the machine. This is a trouble frequently encountered in alternating current apparatus, and often occurs in generators, motors and transformers. In one case brought to our knowledge the defect was most desirable, namely, where a potential transformer was mounted on a switchboard. It so happened that at proper voltage the hum produced had a very distinctive sound. About one per cent. below normal voltage the sound disappeared entirely, and about one per cent above normal it became quite discordant. It was proposed to replace this potential transformer at one time on account of the loose lamination, but after due consideration had been given to the matter, it was decided that its peculiar properties were a most valuable adjunct, and it is still in use to-day. Possibly in your case a cement of some kind might be inserted between the loose laminations, and the whole pressed tightly together, so that when the cement dried the laminations would adhere firmly to each other and the vibration cease. You can, no doubt, remedy the difficulty by some such simple treatment as the above.

Graphite for Hot Bearings

Q.—Can graphite be used to advantage in lubricating a hot bearing?

A.—Yes, graphite is not affected by heat and therefore it will make an effective lubricant in this instance.

Single Phase Motor on 3-Phase System

Q.—Is it possible to operate single phase self-starting motors on a three-phase system?

A.—Certainly, your single phase motor can be connected across any two leads of the three phase system, just as an incandescent lamp.

Electric Wires Cather Dust

Q.—I have noticed that electric wires seem to gather more dust than surrounding objects. Can you give a reason for this?

A.—Perhaps the fact you mention may be explained on the basis of the feeble electrostatic attraction in the wire due to the difference in potential between it and the earth. Carpet sweepers have been designed on this principle, using static electricity to attract the dust particles. A spiral of plain wire wound around the wire and grounded will nullify the effect.

Dynamo Fails to Build Up

Q.—Will you kindly suggest a remedy for a 110 volt bipolar, shunt-wound dynamo which fails to build up? I have tried reversing the field terminals and every other connection I can think of. The machine has not been run for a year, but I do not imagine that there is any serious trouble with it, for it will generate readily when its field coils are excited with energy from another machine.

A.—The usual causes for such action on the part of a generator are as follows: Residual magnetism too weak or destroyed; reversed connections or reversed direction of rotation; short circuit in the machine or in the external circuit; field coils opposed to each other; open circuit; brushes not in proper position. A short circuit in the external circuit will keep a shunt wound dynamo from building up its field magnetism until the external circuit is opened. Slight short circuits within the machine may bring about the result mentioned. Too many lamps or other load might also cause the defect, in which case the load should be disconnected in starting. The fact that the dynamo operates satisfactorily when its coils are energized from an external circuit indicates that the connections are not reversed and that the magnetism is too weak. Place a voltmeter first across the external source and then across the armature, taking the corresponding readings: the latter reading should exceed the former. If this is not the case, test for all the causes mentioned.

Secondary Load off, Primary Still Carries Current

Q.—If, in an alternating current system, the secondary lamp and motor load be thrown out of circuit, will the primary circuit still draw current from the alternator?

A.—The amount of current passing through the primary winding under the conditions you state would vary from one to five per cent., depending on the full-load efficiency of the transformer. This small amount of current causes repeated reversals of magnetic flux through the iron core and these reversals of magnetic flux induce electromotive forces in both coils. This induced e.m.f. is opposite in direction and very nearly equal to the electro-motive force applied to the primary coil. Only the difference between the applied electromotive force and the induced electric-motive force is available for producing current through the primary coil, and since this difference is small the primary current at no load is small

Opening Secondary Circuit Causes Voltage Rise

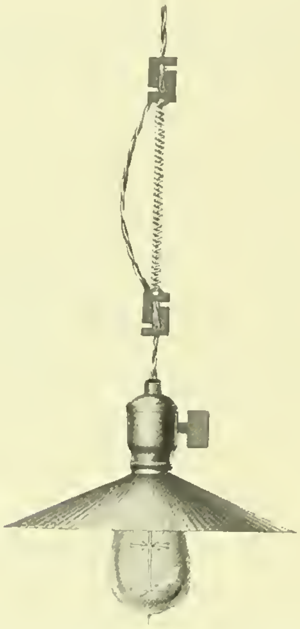
Q.—What causes the enormous rise of the secondary voltage of a series transformer if the secondary circuit be opened while the transformer is in service?

A.—When the secondary of a series transformer is on short circuit a considerable current flows in the secondary circuit and the magneto-motive force of this current is opposed to that of the primary current so that the flux which is produced by the resultant of these two magneto-motive forces is small in value; being just equal to the amount necessary to generate an electro-motive force sufficient to produce the required secondary current in the local secondary impedance. Thus, under normal operation the secondary current is practically equal to the primary current and the flux is extremely small in value. If the secondary circuit be opened and the primary current continues to have its former value, the flux in the core increases enormously because there is no magneto-motive force to oppose the primary magneto-motive force. The secondary electro-motive force varies directly with the flux, so when the secondary circuit is opened the voltage across its terminals, is extremely large. It is noteworthy, moreover, that the voltage across the primary terminals will be correspondingly large, and that the series transformer with its secondary circuit open, interposes a considerable impedance in the circuit.

An Efficient Shock Absorber

Mr. S. Altman, of Vienna, the representative of the celebrated Dr. Hans Kuzel, of the same place, has been visiting Hamilton for a few days as the guest of Mr. W. H. Ginder, the president of the Canadian Tungsten Lamp Company.

Last fall this company built a considerable extension to their already immense factory specially for the construction of the ''Kolloid-Wolfram'' Tungsten Lamp. After inspecting many machines in England, Austria and the United States, they have equipped their factory with the very latest improved machinery and have undoubtedly the most complete and efficient installation for manufacturing tungsten lamps in America.



Mr. Altman inspected this new machinery and stated that he was surprised to find the manufacture of the ''Kolloid-Wolfram'' on so satisfactory a basis, and expressed the opinion that the ''Kolloid-Wolfram'' as manufactured in Hamilton was superior to that previously made abroad. This lamp is not only now being manufactured in Canada but also entirely by Canadian labor.

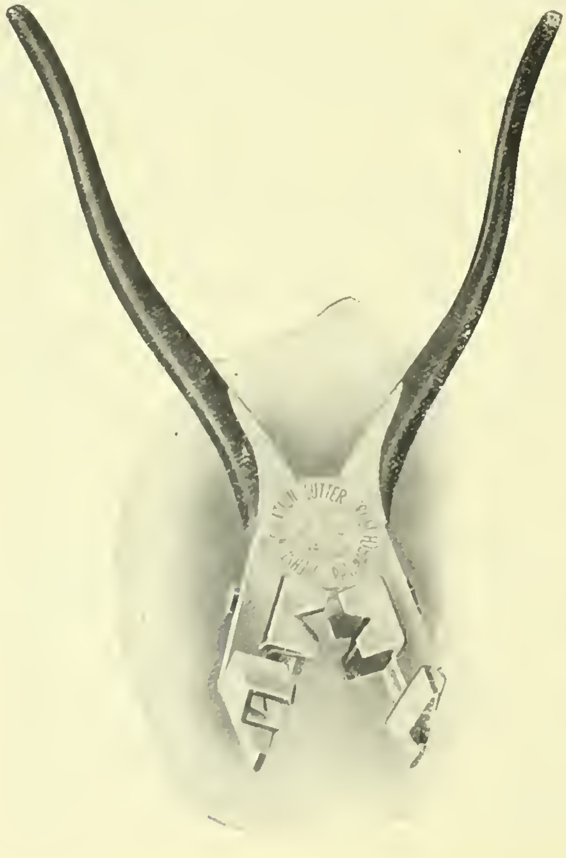
As an aid to the efficiency of metallic filament lamps, the ''K-W'' shock absorber has instantly demonstrated its value. Although but little advertised yet, the orders have so poured in that the Canadian Tungsten Lamp Company have been quite unable to keep up with the demand and have had to double their equipment. They hope in the future, however, to be able to ship promptly all orders for ''K-W'' shock absorbers.

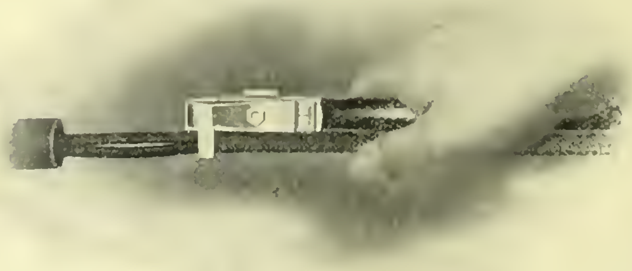
A Canadian in Glasgow

"The Electrical News" is in receipt ot an interesting letter from Mr. David A. Starr, of Glasgow, Scotland, in which the operation of Glasgow's tramway, light and power enterprises, all under municipal control, is described and in which many words of praise for Canadian methods of operation find a conspicuous place. Mr. Starr will be remembered by many as a Canadian and a pioneer here in electrical engineering, though at the present time he is general manager of one of Glasgow's largest suburban enterprises—the Clyde Valley Electrical Power Company, with a capital of about $3,500,000. Strangely enough, the present chairman of the company with which Mr. Starr is associated is also a Canadian by birth, Mr. A. Bonar Law, M.P., who, it has been said, is the hope of the Conservative party in England. Another Canadian, Mr. Grayburn, now of Montreal, was also early associated with Glasgow's electrical enterprises.

The Goehst Insulatfon Cutter

The Goehst Insulation Cutter, manufactured by Mathias Klein & Sons, Chicago, is represented in the following cuts. In a folder issued by the company it is pointed out that more time is wasted by workmen with dull jacknives making joints and connecting cut-out cabinets than on any other part of a wiring installation. The sketches illustrate the neat work that is possible with this device. The cutter is manufactured for use with No. 14 rubber covered wire only, as it is claimed that this size represents more than 99 per cent. of the total total wiring installations. This instrument is euqally effective for slitting as for cutting insulation, and it is claimed that the insulation is cut as rapidly and as clean as a piece of cloth with a pair of scissors.



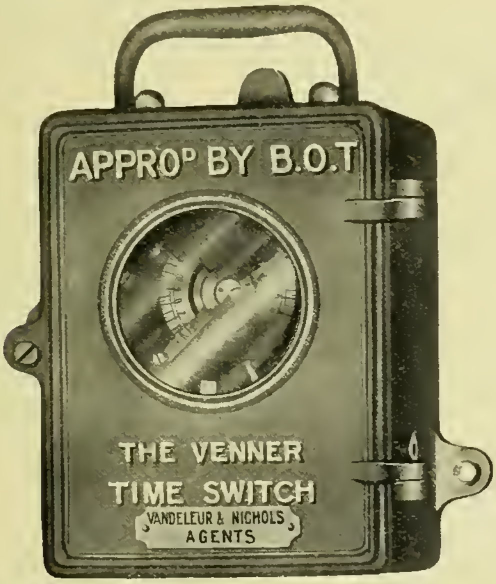


Goehst Insulation Cutter and Samples of its Work

A Reliable Time Switch

Messrs. Vandeleur & Nichols state that, as the Canadian representatives of Messrs. Venner & Company, London, England, they are placing on the market a reliable time switch, for which it is claimed that it is the only time switch that has been approved by the British Board of Trade. This firm further state that "the capabilities of this switch are little short of amazing, for it will do automatically any switching that is done by hand. Venner time switches have two main points, (1) An exceptionally high class clock; and (2) a switch action that is very simple and absolutely positive.

"The clock is by far the best that has ever been used in time switch construction, and the makers are so confident of it that they invite intending purchasers to obtain a comparative report from an independent expert clock maker. It has a fully jewelled lever escapement, including pallets, to prevent rust and wear, and is entirely enclosed in a spun brass dustproof cap. A Brecquet hair spring is used to reduce the wear on the balance spring and pivots to a minimum, thus giving full protection against the three great enemies of clocks—dust, rust and wear. The movement is non-magnetic, compensated for temperature, completely insulated from the switch, and runs forty-five days on one winding. These and other equally important features are well worthy of consideration.



"The switch is very simple. The selective feature is beyond description in a brief space, but it suffices to say that the selective arrangement can be made to meet every possible requirement; in short, it is a switch that does everything except fail, and will prove a boon to those who have problems to solve in window, sign and store, arc and incandescent lighting, two rate meters, etc."

Messrs. Venner & Company's catalogues are well prepared and contain some bright references anent their time switches. It is stated that their time switch is "Cheaper than a human lamp lighter." "Does not fall ill, want holidays or a raise in wages." "Does not stay too long over tea, nor oversleep itself." "Does not switch half the lamps on too soon, and off too late, as it hasn't to 'get round.'"

Recent Book Reviews

Allmanna Svenska Elektriska Aktiebolaget (The General Electric Manufacturing Co'y of Sweden)—This very interesting book dealing with the foundation and steady progress of Scandinavia's largest electrical firm is being distributed by Messrs. Kilmer, Pullen & Burnham, Toronto, their Canadian representatives. During the last sixteen years of this firm's operations the paid up capital has increased ten times, while the yearly turnover has increased thirty times; the number of machines delivered yearly has increased from 65 to 4,470, and their capacity in kilowatts from 670 to 165,500. A very interesting feature of the book is a detailed description of some of the installations and power schemes that have been planned and carried out by this firm. The book is splendidly illustrated and very attractively designed.

Electricity.—By H. M. Hobart, B.Sc., M. Inst. C.E. The Copp, Clark Company, Limited, Toronto, publishers, price $1.80. A very successful attempt to present some of the more recent developments in electricity in a comparatively popular form. The author assumes that a certain general familiarity with electricity is possessed by most people and proceeds to explain in a quite elementary way various aspects of the subject relating to every day practice in the electric engineering profession. Very completely and clearly illustrated.

How to Write a Business Letter—Charles R. Wiers, Buffalo, author. Gies & Company, Buffalo, N.Y., publishers. The author has set forth concisely and in an interesting manner many of the salient points of letter writing. His ideas are those of the modern American business man, and are necessarily tinctured with American ideals, but the broad principles are those upon which successful business letter writing depend. They are expressed clearly and forcibly, so that in the greater number of instances they admit of no contention. A strong point is made of the common habit of using useless expressions, which have received the sanction of long use, but which mean nothing and are really only an encumbrance to letter writing and reading. This class of expression will be quickly recognized from a few examples, viz., "we would say," "we beg to say," "allow us to explain," etc. These forms have arisen probably from a desire to improve the form of a sentence, or to introduce a subject gradually, but they have become meaningless, with long usage, and if one examines them critically they are worse than meaningless, as they are not sincere. Considerable stress is laid upon the necessity for brevity, courtesy, clearness, correct spelling, sincerity, etc. An excellent feature of the book is a large number of examples of letters illustrating the ideas which are dwelt upon. The book itself is to be commended for following the suggestions it contains. It is brief, concise, clear, and well arranged, and will be of value to any business man.

"Tests of Tungsten Lamps," by T. H. Amrine and A. Guell, issued as Bulletin No. 33 of the Engineering Experiment Station of the University of Illinois, presents the results of tests upon tungsten lamps of the 25 watt size. Of the three kinds of lamps tested, one kind was of American manufacture with filaments made by the paste process; the other two kinds were of German manufacture, with filaments made by the colloid and deposition processes. Each tpye of lamp had a different scheme of filament mounting.

From these tests it is shown that—

(1) When the lamps are subject to vibration, the life depends to a great extent upon the scheme of filament mounting, so that a lamp having its filaments mounted in such a manner that they are never under tension ,gives a much better life, when subject to vibration, than one having tightly strung filaments.

(2) After burning 2,000 hours under good conditions of operation, the average candle power of the filaments made by the paste process, decreased to 88 per cent.; of the filaments made by the deposition process to 89 per cent., and of those made by the colloid process to 77 per cent. of the initial value.

(3) The paste filament lamp, with loosely strung filaments, gives the longest life under both good and poor conditions of operation.

(4) The frequent breakage of the filaments during shipment and ordinary handling, and the early blackening of the bulbs, common in the early tungsten lamps, seem to have been overcome in all three types of lamps tested.

Metal Statistics.—The American Metal Market Company, New York, publishers. A review of the year 1909 and comparisons with previous years, as to production, shipments, prices, etc., in the United States of the various metals, iron, steel, copper, tin, spelter, lead, antimony, gold and silver,

Current News and Notes

Brandon, Man.

The city of Brandon has made application to the Manitoba Government for power to construct an electric street railway, and also for changes in their charter to enable them to construct and operate electric power, lighting and heating plants.

The Brandon Electric Light Company is considering the question of increasing the capacity of its plant by the installation of a 1,000 kw. steam turbine and generator.

The Municipal Light, Heat & Power Company, head office, Hamiota, will establish warehouse and plant here in addition to those in operation in Carnduff, Sask. G. Edgar Knetchell, manager.

Bracebridge, Ont.

Alex. C. Salmon, town clerk, writes that the council did not accept any tenders for the erection of Wilson's Falls power house, but will undertake the work by day labor.

Camrose, Alta.

This municipality is open until April 16 to receive propositions from companies or individuals for the installation of an electric light and power plant on a ten-year franchise basis. O. B. Olson, secretary-treasurer.

Campbellford, Ont.

The Seymour Power Company, by agreement with the town of Welland, will install another unit of 1,000 kw. capacity to supply the town's needs for light and power.

Calgary, Alta.

The Calgary Water Power Company have placed an order with the Robb Engineering Company, of Amherst, N.S., for a 1,000 horse-power vertical cross compound condensing engine complete with condenser, heater and pump. They have also placed an order with the Canadian Westinghouse Company, of Hamilton, Ont., for a 600 kw. alternating current generator, complete with exciter and switchboard.

J. A. McCullough has made a proposition to the city council respecting the construction of an electric railway from Calgary to Chestermere Lake. No decision has been reached.

Works Board have recommended that 200 meters of various sizes be contracted for with the Canadian General Electric Company, Toronto, for the coming year; also that 200 five ampere meters or over be contracted for with the Northwest Electric Company, and necessary polyphase meters.

Dutton, Ont.

An extension of the franchise for five years to the Electric Light Company was defeated by the citizens' votes by a large majority.

Edmonton, Alta.

Tenders are being called by the Department of Public Works for the supply of whole or any part of the required estimate of material for telephone construction. List of material, etc., on application to the Superintendent of Telephone office, Department of Public Works, Edmonton. John Stocks, Deputy Minister.

The city will oppose the incorporation of the Edmonton Interurban Railway Company on the ground that it interferes and gives the company the right to compete with city lines by building in or through the city.

Guelph, Ont.

A preliminary survey of the proposed People's Railway between Hespeler and here, with a branch to Puslinch Lake, has been made by Engineer Warfield.

The Ontario Government have granted permission to the People's Railway for the proposed extensions to Wellesley and New Dundee and construction work will commence early this spring. A. N. Warfield, chief engineer.

Goderich, Ont.

James Sharp, of Chicago, formerly of Brussels, has purchased from W. J. Palmer the Brussels electric light works and all connected therewith. Mr. Sharp has had a wide experience in electrical works, and takes possession on April 1st.

Hull, Que.

The following tenders were received for the construction of an addition to the corporation power house: Noel & Ouellette, $19,981; E. Bisson, $23,511.85. These tenders were found too high, and new tenders have been called on a modified form. J. F. Boult, city clerk.

Hamilton, Ont.

The Hamilton, Waterloo & Guelph Railway have placed an order for ties and rails for the construction of the road to Galt.

The Dominion Power & Transmission Company, Limited, have placed an order for 30 cars of cedar ties with the Long Lumber Company of this city.

Ingersoll, Ont.

The Town Council of Ingersoll is negotiating for the purchase of the Ingersoll Electric Company's entire operating and distributing plant. The following gentlemen have been appointed a board of arbitrators to report upon a satisfactory valuation of the company's plant, viz., Messrs. R. A. Ross, Montreal; E. J. Philip, Berlin; and H. A. Moore, Toronto.

Kingston, Ont.

The Leeds Rural Telephone Company's lines are to be extended through Brewer's Mills, Inverary, Sunbury, Battersea, Latimer, Elginburg, Kepler and Glenburnie and will also have a Kingston connection.

Camden township is to have a telephone service, a company has been formed and the capital fixed at $10,000. Dr. M. I. Beemen, president, and J. K. Fraser, secretary. Work will begin immediately.

Hon. Adam Beck stated at Ottawa that the Hydro-Electric Power Commission would within the next six months take up the question of the supply of power to Eastern Ontario. Negotiations have been in progress with ten or eleven municipalities, including Brockville, Kingston and Belleville, and applications have been received for over 12,000 h.p.

London, Ont.

The shareholders of the Southwestern Traction Company, which went into liquidation in October last, will receive 50 cents on the dollar.

Contracts totalling $50,556 were awarded by the Water Commission recently for hydro-electric supplies. The awards include transformers, switchboard and portable instruments to the Canadian Westinghouse Company, and voltage regulators, lamps and reflectors to the Canadian General Electric Company.

The city and the London Electric Company are disputing over the inconvenience that each claims the transmission poles of the other will cause, these poles being of varying heights.

A scheme is on foot to install an underground system of power distribution in the business section, the city to contribute as much as a pole line would cost and the business men to bear the balance of the expense.

Now that the charter to the London & Lake Erie Railway & Transportation Company (the old South Western Traction) has been granted, construction work on the line from Brantford to London will be commenced this spring. It is the intention that the company shall complete the section from Paris to Woodstock and also from Paris to St. George in the near future.

Moose Jaw, Sask.

S. P. Porter, Deputy Minister of Railways and Telephones, has announced that the Department would spend $125,000 in the city this year. A completely new central energy telephone system will be installed and a handsome exchange building erected, a site for which has already been purchased. The Department has also decided to complete the long distance line to Outlook this year, a distance of 125 miles, and possibly one from Moose Jaw to Swift Current.

A by-law will shortly be submitted to the ratepayers asking power to ratify an agreement with a private company that offers to construct a street railway.

Moncton, N.B.

The city council decided to ask for legislation giving them authority to consider and enter into an agreement with the Moncton Street Railway Company to lease or sell the city lighting plant. A rider is attached to the legislation making it imperative to submit the agreement to a plebiscite before the terms can finally be agreed to.

Midland, Ont.

In addition to the contract let to the Wm. Hamilton Company, noted in last issue, for 5 turbines, etc., contracts have also been awarded as follows:—Two 200 h.p. exciter turbines, William Hamilton Company, manufactured under the Leffel design; two feed pipes with the regulating stand pipes, Wm. Hamilton Company. All the electrical machinery, Canadian Westinghouse Company, covering up to five 900 k.v.a generators and two 100 kw. exciters with transformers, switching and lighting arrestor equipments for both the Big Chute and Midland stations. Line wire, Northern Aluminum Company; insulaters, Pittsburg High Voltage Insulator Company. Pratt & McDougall, of Midland, have the general construction well under way. It is also announced on good authority that the Simcoe Railway & Power Company, for whom this construction is being done, will ultimately construct an electric railroad to serve this district. Mitchell & Mitchell, consulting engineers, Traders Bank Building, Toronto.

Montreal, Que.

Tenders have been called for the electric lighting by arc lamps, style "magnetite" (last model), of 1200 to 1500 candle power, the contract to be for one hundred lamps, with privilege for the town to increase that number. M. G. Eerement, secretary-treasurer, town of Maisonneuve.

The Bergmann Electrical Works, of Berlin, Germany, manufacturers of tungsten lamps, are considering the location of a branch industry here. For further information apply to Dr. C. Rossner, 341 Dorchester street west.

The Montreal Street Railway Company have made application to the Council for the permission to increase its trackage in this city by thirteen miles.

The Montreal Light, Heat & Power Company has obtained a judgment by default against Messrs. Johnson, of Leeds, England, for $35,144.15. Under contracts made in 1905 and 1906, the defendants had agreed to furnish the Power Company with a coke briquetting plant, but the contracts were not fulfilled.

The Bell Telephone Company will install conduit systems on several of the city streets during the coming year.

The Central Light, Heat & Power Company are applying to the Quebec Legislature for an extension of their charter privileges which will enable them to distribute power through the City of Montreal.

The Dominion Light, Heat & Power Company, Montreal, will apply to the Quebec Legislature for permission to increase their capital stock.

The Montreal Company, capital $20,000, has been incorporated to manufacture and supply electricity in the counties of Bagot, etc. Incorporators, David King, insurance agent, Montreal, Que.; H. C. Moore, barrister, Chatham, Ont., and others.

The board of arbitrators appointed to determine the value of property belonging to the St. Paul Land Hydraulic Company and expropriated by the Canadian Pacific Railway Company, has named the sum of $35,000. During previous negotiations the C. P. R. had offered $8,000, while the owners having in mind the value of the property as a possible site for electrical development, due to its vicinity to the Lachine Canal, asked $150,000.

Canadian telegraph companies are considering the advisability of adopting a special night rate by which fifty words may be sent by telegraph at night for the same amount as ten words cost during the day time.

The "Montreal Underground & Elevated Railway," capital $20,000,000, has acquired charter rights which include the operation of electric railways in and around Montreal, the acquiring and development of waterpowers and construction and operation of telegraph and telephone systems.

The senate has amended the Montreal Terminal Bill by requiring that the consent of the city of Montreal must be obtained before suburban traffic can be carried in the city. Amendments were also made in the Ottawa, Montreal & Eastern Railway Bill requiring the consent of municipalities before lines can be constructed along highways.

Norwich, Ont.

This municipality proposes to take 150 horse-power at $30 per horse-power, and Tilsonburg 500 horse-power at $30.50 from the Hydro-Electric Commission. These towns will be fed from Woodstock at 12,000 volts.

Nelson, B.C.

Nelson will sell its electric light to householders by meter hereafter and abandon the flat rate.

The Nelson Street Railway Company have ordered cars from the Ottawa Car Company, of Ottawa while rails for extensions will be supplied by Evans, Coleman & Evans, of Vancouver, B.C. Contracts for building new lines will be let at an early date.

Niagara Falls, Ont.

The Ontario Power Company will not use a metal lining in its second 18 foot water conducting tube now under construction, but will use only reinforced concrete. This plan meets the approval of the company's engineers and in addition is cheaper and can be constructed without delay.

An Act of incorporation of the Niagara Falls, Welland & Dunnville Electric Railway. The capital stock of the company is $200,000. Bonds may be issued for $30,000 a mile. The provisional directors are J. Carlton Gardner, civil engineer, Niagara Falls; George Arnold, F. E. Misener, G. H. Burgar and H. A. Rose. The head office will be located here. The company may build a single or double track. They can run in the following townships: Stamford, Thorold, Crowland, Town of Welland, Humberstone, Wainfleet, Moulton and Sherbrooke. A branch line may be run through Pelham and Thorold. A branch line to St. Catharines is also being discussed.

Owen Sound, Ont.

Manager Polson, of the Bell Telephone Company, has announced that during the coming year the present system of ringing the bell by hand will be done away with and replaced by a central energy system similar to that used in Toronto and other large places. There are at present 515 telephones in Owen Sound and 100 rural subscribers making connection.

Ottawa, Ont.

The city engineer's department has completed the surveys and levels for the proposed subway and overhead bridge in the neighborhood of Concord street and Hawthorne avenue for the proposed extension of the street railway line to Ottawa East. Plans and estimates will be ready at an early date for submission to the street railway extension committee.

The cost of the proposed street railway extension through Ottawa East, according to City Engineer Ker's estimate, will be $75,000. The cost will likely be the same for either of the two routes suggested.

The City of Ottawa municipal electric department has called for tenders on meters, transformers, incandescent and arc lamps, wire, globes, carbons, hardware and sundry supplies. J. E. Brown, Superintendent.

Word has been received in Ottawa that the United States War Department will have an official report made as to the effect of the Long Sault dam project on the St. Lawrence river navigation.

The Government has provided for the expenditure of $50,000 for investigating the electric processes in use in the production of zinc. Some of the processes in use on the European Continent will be investigated and experiments will be made at Nelson, B.C.

The Ottawa, Montreal & Eastern Railway Company's bill, which provides for the construction of a railway line from Lake Megantic to Ottawa, a distance of 250 miles and passing by tunnel under the St. Lawrence at Montreal, was adopted subject to the approval of the Montreal city council.

The Hon. Mr. Graham has introduced a Government bill providing that telegraph and electric transmission wires may be strung over railways without necessarily waiting for an order from the Board of Railway Commissioners. The bill also provides that working agreements between telegraph companies must be approved by the Commission in the same way as now applies to agreements made between telephone companies.

Peterborough, Ont.

The by-law to raise $70,000 to develop the surplus power at the new waterworks dam will be voted on by the ratepayers on Tuesday, April 19.

Prince Albert, Sask.

In view of the report recently submitted to the city council by Mr. C. H. Mitchell, of Toronto, in the matter of La Colle Falls power development, Secretary Woodward has been instructed to communicate with the cities using water power and find out what is paid for hydro-electric energy in these places.

Parry Sound, Ont.

It is proposed to install at the municipal electric light plant a series street lighting system; it is also proposed to put the whole system on meters this year.

Council contemplate ordering extensions to electric light plant. G. Groves, superintendent.

Prince Rupert, B.C.

The Tsimpsean Light & Power Company propose expending about $1,250,000 in the development of 7,000 or 8,000 h.p. at Khtada Falls. Among those interested are E. B. Greenshields, Montreal, and G. McConnell, vice-president Canadian Light & Power Company.

The B. C. Mainland & Coast Development Company are applying to the Provincial Parliament for a charter to erect and operate a smelter and further to operate in conjunction a gas and electric power plant to supply the needs of Prince Rupert.

The citizens of Prince Rupert are determined that the municipality shall be free from the outset to install its own water works, telephone exchange and power and lighting plants. They see danger ahead in a charter granted several years ago to the Tsimpsean Power & Light Company, a representative of which syndicate recently visited Prince Rupert and announced his intention of making a start this spring in installing an electric lighting plant. Other wide powers were given this company over a radius of seventy-five miles from its waterpower, Prince Rupert being included The city resists this claim and demands that the franchise be cancelled for failure to comply with certain legal requirements. It goes further, demanding that water rights on various streams near Prince Rupert, now recorded in the names of private parties, be revoked as detrimental to the future of the city. These water rights are located in the Hoxtol and Katawaba rivers. One result of the present agitation has been the reservation of all other water powers in that locality by the Provincial Government.

The Prince Rupert Telephone Company,

has entered into a contract with the Dean Electric Company, of Elyria, Ohio, for a telephone system to cost $10,000. The system will be turned over to the city when incorporated.

Quebec, Que.

The Quebec Railway, Light, Heat & Power Company has issued a writ of injunction against the Canadian Northern Railway to prevent them using the bridge over the St. Charles river, which is claimed to have been the joint property of the former and the Quebec & Lake St. John Railway. This latter road passed into the hands of the Canadian Northern some time ago, which company has been running trains of the Canadian Northern and Quebec & Lake St. John Railway over it.

The Dorchester Electric Company will apply to the Legislature for power to deal in electricity and to go, without permission, through a number of municipalities, the city of Quebec and the town of Levis. The object is to supply light and power.

The Saint George Electric Company will apply to the Legislature of Quebec, at its next session, for an act to extend their first electric line from Sainte Marie, Beauce, to the village of Chaudiere Curve, and also to give them powers to build a line of electric tramway from the Saint George Railway Station on the Quebec Central Railway, passing through the village of Saint George, in the county of Beauce and the valley of La Riviere du Loup, in the county of Beauce, to some point on the boundary line in the direction of the state of Maine.

A notice is published in the Quebec Official Gazette stating that the Quebec & Island or Orleans Railway will ask the Legislature for an extension of time to commence the construction of its line, and asking at the same time power to build that line on the monorail plan.

Regina, Sask.

Mayor R. H. Williams has been in Winnipeg to make arrangements for the construction of a street railway. Eight miles of track will be laid this year.

The report of the electric plant just issued shows a surplus of $27,844, which it is proposed to spend on additional equipment.

Stratford, Ont.

A by-law will be submitted to the ratepayers for the sum of $85,000 to provide a plant for distribution of Niagara power from the Hydro-Electric Commission.

St. Catharines, Ont.

The promoters of the proposed Dunnville, Welland & Beamsville Electric Railway are asking the city of St. Catharines to guarantee bonds to the amount of about a quarter of a million for an extension of this road from Beamsville to St. Catharines.

The Bell Telephone Company during the present year will further increase their underground mains along St. Catharines streets and reduce their overhead wiring.

Summerside, P.E.I.

A new street lighting contract has been made between this town and the Sun Electric Company to install twenty 80 candle power and forty-six 32 candle power tungsten lamps, with all modern equipment, at an estimated cost of $1,500.

Sherbrooke, Que.

A by-law granting a 28 years' franchise to Sherbrooke Railway Company carried by a majority of 251. In return for the franchise the company promises to extend the system more than double what it is now, and will spend $500,000 in this and in the development of a power plant. The company has an option on the water power of the Magog river, which runs through the city. Montreal capitalists are behind the scheme.

Sydney, N.S.

The Eastern Telephone Company are greatly improving their system in this city. All the wires which, until recently, have formed a complicated overhead network, are being assembled in two cables and the cross bars are being removed from the poles.

St. Thomas, Ont.

This city will install 650 tungsten street lamps in the near future.

The bill abolishing the St. Thomas Street Railway Commission has passed, which also provides that the control of the system be placed in the hands of the city council.

St. John, N.B.

The question of installing a hydro-electric plant is again under discussion. Two falls are available, one on the Mispec river, capacity 240 h.p., 60 foot head, the other on the Little river, capacity 210 h.p. This amount, however, is not available in either case during the dry season, and it is now proposed to connect the two rivers by a canal.

Thirty men in the employ of the street railway, eighteen motormen and twelve conductors, received cash bonuses a few days since as rewards for faithful service during the year ending February 28th last. These are the result of the merit and demerit system introduced a year ago by the company and which so far has been very successful. The idea was that each motorman and conductor should receive merit or demerit marks according to the nature of the service he had rendered during the twelve months. None of the thirty men who received the bonuses had a single demerit mark against their names.

The Union of New Brunswick municipalities have adopted a resolution calling upon the Provincial Government to amend the telephone companies' act so that tolls and rates cannot be increased without the consent of the Lieutenant-Governor-in-Council and without giving those interested a hearing. A resolution was also passed urging the Government to protect and preserve the natural water powers of the province.

Saskatoon, Sask.

The council have appointed a special committee to arrange terms with the Saskatoon Power Company.

Sydney, N.S.

The recommendation of the Board of Works to grant permission to the Dominion Railway and Plaster Company to build and operate a tramway on certain streets of this city was adopted by the council, with certain provisions.

St. Mary's, N.B.

The Fredericton Street Railway Company is said to be considering a plan to construct an electric railway, which will connect St. Mary's, Gibson, Maryville and Nashwaaksis on one side of the river and Springhill and Victoria Mill on the other side.

Three Rivers, Que.

The Colonial Engineering Company, Limited, Montreal, have made an offer to the corporation for the lighting of the city and the pumping of water at the aqueduct. The company propose to install a producer gas engine equipment.

Trenton, Ont.

The question of the expropriation of the works and property of the Trenton Electric Company by the town of Trenton has been left in the hands of the Hydro-Electric Commission, who will examine into and deal with the differences between the town and the company and report what may fairly be done.

Toronto, Ont.

The Erindale Power Company sustained a loss of $1,200 by an unexpected flow of ice.

A new clause has been added to the city of Toronto's "tube" legislation which provides for "compensation for damages suffered by any railway company by the work of actual construction of such tube system." H. S. Osler, for the Toronto Street Railway Company, was instrumental in having the clause inserted.

Mr. Justice Riddell has consented to reopen the action of the Ontario Government against the Canadian Niagara Power Company, in which His Lordship made a finding nine months ago against the plaintiffs.

Toronto street railways have in the past carried the postmen for the lump sum of $4,800. The company estimate the number of rides at 500,000 a year and are asking for an increase in the payment to about $20,000.

City Electrical Engineer Aitken has recommended the acceptance of the tender of the Canadian British Insulated, Limitted, Montreal, for the supply of three-core cable for the civic electrical distribution plant. The tender was $48,024.50.

Included in the supplementary estimates ot the Provincial Treasurer are the following items: Electric plant, Hamilton Asylum, $12,000; electric plant, London Asylum, $25,000; electric plant, Ontario Agricultural College, Guelph, $15,000.

Justice Britton has quashed the bylaw authorizing Blanchard township to raise $20,000 for the purpose of taking over debentures of the St. Marys & Western Railway.

The contract for the supply of core cable for the electric power plant was awarded by the council to the Canadian-British Insulated, Limited, Montreal, $48,024.50. The next lowest tender was $48,188.85.

The bill to incorporate the Niagara Falls, Welland & Dunnville Electric Railway Company has been passed by the Ontario Legislature.

It is learned officially that the Board of Railway Commissioners are considering the passing of an order requiring the equipment of all electric railway cars with power brakes and that the matter is set down for hearing in May. The street railway companies, it is understood, are perfectly willing to equip all large double truck cars with power brakes, but contend that it is unnecessary to equip the lighter double truck cars and single truck cars with such brakes, it being contended that hand brakes are sufficient and in some respects better.

The Monarch Electric Railway, which, it is said, will connect Orillia and Barrie with Toronto, has been refused, by the Railway Committee of the Legislature, power to enter the city of Toronto.

Mr. W. D. Beardmore, through his solicitors, has served notice on the city legal department that he will carry his appeal in the electric power case to the Court of Appeal. Mr. Beardmore seeks to set aside

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the city's contract with the Hydro-Electric Power Commission and prevent the city from supplying power to the citizens.

The Bell Telephone "Junction" Exchange has been moved to a new building on Keele street. Present accommodation is for 500 'phones with ultimate capacity of 5,600.

Another big transcontinental telegraph line to compete with the two existing systems operated by the Can. Pac. Ry. and the Great North-Western Telegraph Company will in all probability be built in the near future by Mackenzie & Mann.

Vancouver, B.C.

City Electrician McCrossan, having reported adversely on the lighting system of Granville street bridge, was authorized to call for tenders for reconstructing the lighting system. Estimated cost, $1,500.

The sub-committee appointed to visit Portland and Seattle in reference to the lighting system in vogue there, reported to the effect that, if ornament was the chief consideration they would recommend the five light standard tungsten, but if illumination was the object, the magnetite arc lamp in pairs, poles 125 feet apart, was better.

The quantity of copper produced from British Columbia mines in 1909 was 41,000,000 lbs., as compared with 47,250,000 lbs in 1908. The value in 1909 is placed at $5,289,000, as compared with $6,250,000 in 1908.

It is believed Premier McBride will not, at the present session, at least, act on the recommendations of Vancouver, New Westminster and several other smaller places throughout the province, to place all telephone operation under Government control.

Victoria, B.C.

The new provincial inspectors of tramways and of electrical plants and appliances, created under legislation of the just closed session, will shortly be appointed, the appointees being required to take up residence in Vancouver, which is regarded as the natural centre of their usful activities in the public safety.

The British Columbia Electric Railway Company may institute a system of electric clocks throughout the city.

The acceptance of the tender of the Hinton Electrical Company for sixteen poles at a total cost of $1,840 has been recommended. Tenders for carbons for the street lighting service to be considered shortly.

The following prices for pillars for lighting system were quoted: Victoria Machinery Depot, $69 each; Marine Iron Works, $58.80; E. A. Earl & Company, London, $17.78; without globes or wiring, or $58.45 complete; Hutchinson Bros., $73.50; Findlay, Durham & Brodie, $72.50, wiring and globes not included, $93 complete; Hayward & Dodds, $78, with globes of larger sizes, $86 and $88. It was decided to call for tenders for 200 pillars and lamp attachments.

Walkerton, Ont.

The municipalities of Bruce, Kincardine and Port Elgin are considering the question of installing rural telephone systems.

Wetaskiwin, Alta.

The by law to raise $5,000 for extension of power plant has been carried.

Welland, Ont.

C. J. Laughlin, of Hartford, Conn., is asking the town for a twenty year franchise to build and operate an electric railway on certain streets of Welland. This road would conflict with the Niagara Falls, Welland & Dunnville.

George H. Pettit is solicitor for a company organized to build an electric railway from Queenston to Niagara. The length of the railway will be seven miles and will cost about $50,000.

Winnipeg, Man.

Canadian Westinghouse has been awarded the contract for the supply of equipment for the power terminal station at Winnipeg. The amount, $116,500, was larger than the next competitor, Siemens Company, of England, by some $4,000, but in view of the fact that the apparatus at the generating station is being installed by the Westinghouse Company it was deemed a good business policy to preserve uniformity.

The civic power committee, on the request of W. W. Coleman and W. Montgomery, secretary Stonewall Board of Trade, decided to instruct the power engineers to furnish an estimate as soon as possible on the cost of delivering 1,000 h.p. at a sub station in Stonewall. City electrician, Cambridge.

It has been decided to erect a wireless station here.

Incorporation is being sought by the Rural Railway Company of Manitoba. The object of the company is to construct, etc., an electric or steam railway and telegraph and telephone line in the city of St. Boniface to connect with a point on the American frontier at or near Emerson, etc. Provisional directors, Dr. Albert Galliot, of Notre Dame des Lourdes; Francois Deniset, Prosper Gevaert, both of Winnipeg. Capitalization, $200,000.

The council awarded the contract for the equipment of the terminal station to the Canadian Westinghouse Company, $116,500, and to Claydon Bros., the contract for the erection of terminal station, $78,159.51.

Messrs. Smith, Kerry & Chace have submitted an estimate to the Board of Control covering the cost of the proposed underground conduit system, involving an expenditure of about $1,200,000. It has not yet been decided what amount of this work will be proceeded with, but it is probable that the conduit system will be put in at first from the terminal station to the McPhillips street pumping station to enable the city to use its own power for pumping purposes as soon as possible. This part of the work, it is estimated, will cost in the neighborhood of $150,000.

The hydraulic governors to be used in the municipal power plant at Point du Bois will be supplied by the Jens Orten-Boving Company, of London, England. This same firm is also supplying the turbines for this installation.

The bill introduced by T. H. Johnson, Winnipeg West, to amend the Winnipeg charter and break the commercial lighting monopoly at present held by the Winnipeg Electric Railway, was voted down by the Roblin Government.

Professor Herdt states that the electrolysis troubles in Winnipeg are practically eliminated, due to favorable locations of the new substations and to the rebonding of the tracks.

The Provincial Treasurer of Manitoba in his annual statement to the Legislature stated that telephone construction for the year 1909 had exceeded the amount voted by $387,000. The estimated extensions during 1910 will cost $2,500,000. There are 5,180 miles long distance, as compared with 3,350 two years ago. The total number of subscribers is 25,300, which has nearly doubled in two years. There are 7,000 farmers with rural telephones.

Among the tenders received by the Board of Control of the city of Winnipeg for terminal station apparatus was one from Prague, Bohemia.

It is expected the city of Winnipeg will be receiving from their own power house well up to 17,000 horse power by the middle of 1911, and Mayor Evans is urging the necessity of securing a market for part of this amount.

The Street Railway Company in future will pursue the policy of establishing belt line routes wherever possible. During 1909 six miles of new track were laid, having concrete foundations and using 80 pound rails.

City Electrician Cambridge's yearly report on electrical conditions in Winnipeg during 1909 contained the statement that out of 13 inquiries as to fires, three resulted in the origin being traced to defective electrical installation.

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TORONTO WINNIPEG

Recent Trade Publications

Pittsburgh Transformer Company — Bulletins 1100, 1102, explaining respectively the new Pittsburgh fuse blocks and the Pittsburgh bell ringing transformers. The latter has been placed on the market as a result of the demand for low voltage alternating current in homes and offices, and is suitable for operating door bells, buzzers, toys, alarms, etc., thus doing away with batteries.

''Never Break'' Lamp Guards—Booklet No. 56, issued by the Canadian General Electric Company, Toronto, explains, with prices and illustrations, the many forms of lamp guards they manufacture to protect lamps of every kind and in every position.

Peebles A.C. Generators—Pamphlet No. 13A, distributed by Vandeleur & Nichols, Toronto, Canadian representatives. The specifications of their various alternators are minutely described, and are classified at the end in six tables. The classifications include both 25 and 50 cycle alternators, with voltages from 200 up to 6,600 and capacities from 50 to 1,250 k.v.a. Photographs of a number of actual installations are also shown.

Ignition Appliances and Auto Accessories—A supply catalogue issued by the Canadian General Electric Company, Toronto, covering the accessories for automobiles, various types of spark coils, magnetos, spark plugs, timers and distributors, search lights, horns, flash lights, boat lamps, carbureters, lubricators, battery testing instruments, etc. A few pages are devoted to 6 volt tungsten lamps, 2 to 16 c.p., with corresponding sockets and receptacles. Prices given throughout.

Tate Bifunctional Accumulator—A descriptive pamphlet issued by the Tate Accumulator Company of Canada, Limited, Toronto, setting forth the advantages of a new storage battery for automobile use. For this accumulator it is claimed, greater capacity for given weight, longer life than any other, requires practically no attention, no sediment in the jars, no washing, highest known efficiency until the charge is exhausted.

MOONLIGHT SCHEDULE FOR APRIL

(Courtesy of the National Carbon Company, Cleveland, Ohio.

Date.	Light.	Date.	Extinguish.	No. of Hours
Apr. 1	6 50	Apr. 2	2 40	7 50
2	6 50	3	3 40	8 50
3	6 50	4	4 30	9 40
4	7 00	5	5 00	10 00
5	7 00	6	4 50	9 50
6	7 00	7	4 50	9 50
7	7 00	8	4 50	9 50
8	7 00	9	4 50	9 50
9	7 00	10	4 50	9 50
10	7 00	11	4 50	9 50
11	7 00	12	4 40	9 40
12	7 00	13	4 40	9 40
13	10 00	14	4 40	6 40
14	11 10	15	4 40	5 30
16	0 10	16	4 40	4 30
17	0 50	17	4 40	3 50
18	1 30	18	4 40	3 10
19	2 00	19	4 30	2 30
20	2 30	20	4 30	2 00
21	No Light	21	No Light	
22	" "	22	" "	
23	" "	23	" "	
24	" "	24	" "	
25	7 20	25	9 40	2 20
26	7 20	26	10 40	3 20
27	7 20	27	11 10	4 20
28	7 20	29	0 40	5 20
29	7 20	30	1 30	6 10
30	7 20	May 1	2 20	7 00
		Total	....	171 20

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EDITOR'S ANNOUNCEMENT.

Correspondence is invited upon all topics coming legitimately within the scope of this journal. Subscribers can materially assist by sending in news items and information regarding electrical development in all parts of Canada.

Vol. 19 Toronto, May, 1910 No. 5

Conserve, but Also Develop

It is little wonder if the Long Sault Development Bill is shorn of most of its objectionable features, considering the onslaughts made on it by prominent members on both sides of the House, but at this distance it looks as if wisdom had finally prevailed. The Opposition side of the House, among whom the most resourceful fighter appears to have been Major Sharpe by their all night session and their determined stand against the bill weakened the charge of the attacking capitalists. The Hon. Clifford Sifton, both as Chairman of the Commission on Conservation of Natural Resources and as a member of the Government, strenuously opposed the measure. The final blow was dealt when the Premier openly expressed his opposition to any scheme whatever for damming the St. Lawrence. As the bill stands the St. Lawrence Power Transmission Company is given power to transmit electrical energy, but the St. Lawrence Power Company gets no additional power to generate beyond its original charter allowance, some 5,000 h.p. By one of the amendments added to the bill the St. Lawrence River cannot at any time be dammed without the plans being first submitted to Parliament, thus removing an objectionable feature in the bill of 1901, which gave very wide powers to the St. Lawrence Power Company.

The damming of the St. Lawrence river and the development thereby of electrical power for Eastern Ontario are questions that fortunately need not become in any way associated with party politics. There are doubtless different opinions as to the feasibility of or the necessity for this work at the present time, but on one point there can be no possible reason for disagreement—when the time does come, as in our opinion it will, to utilize this immense and practically, at the present time, wasted supply of energy in the extension of Canada's material resources, it shall be utilized solely for the benefit of the people who own it and not for our neighbors to the south. In so far, at least, as the opposition to this power bill has made the exportation of electric energy to the United States impossible, it has our heartiest support, and any scheme of conservation, especially if that includes also utilization, of Canadian natural resources for the Canadian people alone will ever receive such unqualified and outspoken assistance as it may be in our power to render.

Montreal and its Eight Power Charters

Should the Quebec Legislature see fit to acquiesce in the requests that are at present before them for consideration, the city of Montreal will have at her command eight power companies who will have charter rights to operate within the city limits.

First on this list is the Montreal Light, Heat & Power Company, whose present operations in Montreal are too well known to need comment at the present time.

The Central Light, Heat & Power Company has been operating in a limited way, in the down-town district, largely supplying steam for heating purposes, but also lighting several of the larger offices and factories. This company is now asking for an extension of their charter rights that will enable them to carry on their operations throughout the city.

The Saraguay and the Montreal Electric Companies have also been organized for some little time, and the former is supplying electric power, from a steam development, in the northern part of the city.

The Beauharnois Light, Heat & Power Company are asking the Quebec Legislature for authority to do business in the city of Montreal. For some time past this company has been supplying the town of Beauharnois with its lighting and power requirements from a small development on the St. Francis river, which rises from Lake St. Francis. They now ask that they be allowed to increase their capitalization to four million dollars and to operate a water supply company with Lake St. Francis as a basis.

The Canadian Light & Power Company are making excellent progress with their development of 20,000 horse-power at St. Timothee.

Part of the preliminary construction work has already been described in these columns, and further extensive contracts have just been let in connection with this development that mean a further outlay of $750,000.

The Dominion Light, Heat & Power Company are making rapid strides with their gas producer plant in Maisonneuve and expect to deliver electric power early in May. Already they have their pole lines completed from Maisonneuve, along St. Catherine street to the centre of the city.

Lastly there is the Merchants Light, Heat & Power Company, who were incorporated by special Act of Legislative Assembly in 1909. Up to date this company have done nothing beyond organization, but intend to develop approximately 3,000 steam horse-power for distribution in the city of Montreal.

Just what the situation will be with all these companies operating is difficult to surmise. That they will all be profit-making concerns seems hardly credible, and just what appearance the city streets will present with each company operating its own pole service is yet more difficult to picture. It is true that this difficulty could be obviated by the use of conduit systems, which doubtless the city will insist upon.

On the other hand, it would not be difficult to imagine a possible climax to the situation, namely, the absorption of the younger companies as they appear upon the commercial horizon, by that long established and wealthy corporation, the Montreal Light, Heat & Power Company. This move would be possible except in the case of the Canadian Light & Power Company, in whose charter is inserted a clause that prohibits a transfer of their rights and properties to a competitor concern.

In any event some understanding will surely be reached that will prevent the unfortunate occurrence of a rate war in the city of Montreal. Such a thing would be a calamity, not only to the lighting companies interested but to the whole commercial life of the city.

Tsimpseau Light and Power Company

The Tsimpseau Light & Power Company, of Prince Rupert, B.C., have been granted a charter to develop electrical power on the Khtada river and to operate light, heat and power systems, electric tramways, etc., within the town of Prince Rupert.

Mr. W. J. Davis, of San Francisco, California, has been engaged to act in the capacity of consulting engineer for the new company, and it is estimated that 20,000 horse-power is available for the company's development. Mr. E. B. Greenshields and Mr. G. McConnell, of Montreal, are interested, and we learn that it is the intention of the company to proceed with construction work during the present season.

Winnipeg to Vancouver by Wireless Telephone

Dr. Lee DeForest is at present in Winnipeg, where he has decided to establish a manufacturing plant and laboratory for his wireless apparatus. The intention of the Radio Tone Company, as the DeForest Company is called, is to establish wireless telephone stations at Winnipeg, Brandon, Regina, Calgary, Vancouver, and possibly some other points in the West.

Dr. DeForest delivered a lecture before the local branch of the Canadian Society of Civil Engineers in the University Building, Winnipeg, on wireless telegraphy and telephony on Thursday evening, the 14th inst. In the course of his remarks he referred to the rapid advances which had been made in the science since the original system was brought out, using the spark transmitter and the coherer. It had soon been found that undamped oscillations were an absolute necessity if tuning were to be made practicable. The first step, then, was to develop a generator for undamped oscillations. Two kinds of generators have been used; first, a modified form of the ordinary alternating current generator, having a very large number of poles and designed to run at a high speed so as to produce the required frequency, and second, the arc generator in which high frequency undamped oscillations are produced from a continuous current arc shunted by a suitable capacity.

The lecturer discussed the various receiving devices, principally the coherer, the crystal detector, the electrolytic detector, and the glow lamp detector or "audion." On account of their inherent slowness, the coherer and the crystal detector were not as suitable for telephone work as the audion. In the coherer the slowness was due to the time it took for the filings to regain their original condition. The thermal effect in the crystal detector also took an appreciable time, while the audion, which depended on the change in apparent resistance of a highly rarified gas under the action of high frequency oscillations, was sufficiently rapid in its action to follow the vibrations of frequencies audible to the human ear.

The question of distance limit for wireless telephony was discussed and Dr. DeForest stated that he had reached a distance of between 200 and 300 miles under ideal conditions, but that the commercial distance at the present time was in the neighborhood of 150 miles. The maximum distance at which telephony can be satisfactorily carried on is in the present state of the art determined by the current carrying capacity of the microphone, which is used in the aerial circuit. By water cooling this capacity had been brought up to 5 amperes and under exceptional circumstances 10 amperes had been used. The effect of the microphone was to vary the resistance of the aerial thus causing the amplitude of a continuous train of undamped oscillations to vary with the vibrations produced by the voice.

Indications of a Big Meeting

Just two months till the Annual Convention of the Canadian Electrical Association.

Mark the place and date in your diary—Royal Muskoka Hotel, Muskoka Lakes, July 6, 7 and 8. It will be a splendid opportunity for an outing with your family and friends in the finest summer resort district in America.

Everyone identified with the electrical industry in Canada should endeavor to be at this convention. It will be a big success. Special and unusual features of entertainment are being arranged, and several of the most prominent electrical men in the United States have signified their intention of being present.

The Committee of Arrangements desire to be able to estimate the attendance at the earliest possible date. As soon as you decide to be present, advise the Secretary, T. S. Young, Confederation Life Building, Toronto, by whom reservations for hotel accommodation will also be made. Do not wait until the eleventh hour. If not a member of the Association, ask for application form.

A word to members. Let the result of co-operation be shown in this convention. Do your duty as a member of the Association. Promote the success of the convention and advance in every possible way the interests of the organization of which you are a part.

C.G.E. Extending in Peterborough

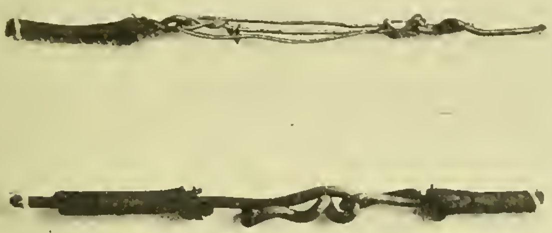
Owing to the material increase in the business of the Canadian General Electric Company, whose facilities, enlarged only three or four years ago, are again becoming overtaxed, it has been decided to expend, in the immediate future, about $250,000 in further additions to their Peterboro plant. These extensions will comprise the addition of three storeys to the engineering office building, an extension of about 300 feet to the main machine shop, giving that shop a total length of about 1,000 feet, the erection of a new stores building about 300 feet long, and a very considerable expenditure for machinery and equipment. Owing to an agreement recently entered into with the corporation of Peterboro, the company will also build a power house at the waterworks dam, and equip it with water wheels and generators for a minimum capacity of 1,000 horsepower.

The Canadian General Electric Company is to be congratulated on the growth of business that makes such large extensions not only possible, but absolutely essential. The Peterboro site plainly possesses many advantages over a larger city, being at the same time fairly centrally located, to which will now be added the additional advantage of cheap and abundant power. All of these favorable conditions making for lower cost of production must, it would appear, benefit the purchaser of this company's goods.

On the other hand, the city of Peterboro has been well advised in placing no obstacle in the way of what appears to the onlooker as a very generous offer. By the agreement the city, at no expense whatever, reaps a yearly benefit of $2,000 for 20 years. At the end of that time the company makes a present of the plant to the city. Apparently this will be a present of no mean proportions, for we understand the city was preparing to submit a by-law for the expenditure of no less than $70,000 on the installation of a similar plant. Further than this, Peterboro will probably benefit by the addition of some two or three hundred workmen to its population, a factor of considerable importance to the trades people. It would not be correct, of course, to say that this company has made Peterboro , but it must be granted that the removal of their works would have meant a grave loss in prestige to the town, and that the contemplated extensions will mean even more than the actual dollars and cents named in the agreement.

The Real Cause of Fires

That gross carelessness alone is responsible for many of the fires that are popularly credited to "electricity," is abundantly evidenced by a state of affairs recently unearthed by the Canadian Fire Underwriters' Association, portions of which are illustrated in the accompanying figure. Mr. Strickland states that "these two joints were found in 'knob and tube' work concealed under the floors of the apartments in a large hotel building. They are not only unsoldered, but are so loose that they will swing around in any direction."



Sample of Electric Wiring recently found under floor of A Hotel Building.

It is very probable that many fires are wrongfully attributed to electric causes, but in view of such discoveries as the above, which, the chief inspector states, are not unusual, it would appear to be the part of wisdom, in the meantime at least, that the wiring inspectors should err on the the side of safety in demanding always the highest standard of insulation and workmanship. In this matter we believe the Underwriters' Association will receive the hearty support of all who are conversant with the situation.

Low Pressure Auxiliary Turbine Doubles Capacity

A recent issue of "Power and The Engineer" publishes a description of a low pressure turbine installation connected to a large compound Corliss engine in the Interborough Rapid Transit Company's plant and summarizes the results of the operation of the combined system. The Corliss engine is Manhattan type, compound, having two 42-inch horizontal high-pressure cylinders and two 86-inch vertical low pressure cylinders and has a maximum rating of 7,500 kilowatts. The complementary turbine installed is of the vertical three stage impulse type, maximum rating also 7,500 kilowatts. The results obtained are especially encouraging for any steam plant that may be nearing its limit, an increase of 100 per cent. in capacity being recorded.

The net results obtained by the installation of the low pressure turbine unit are summarized as follows:

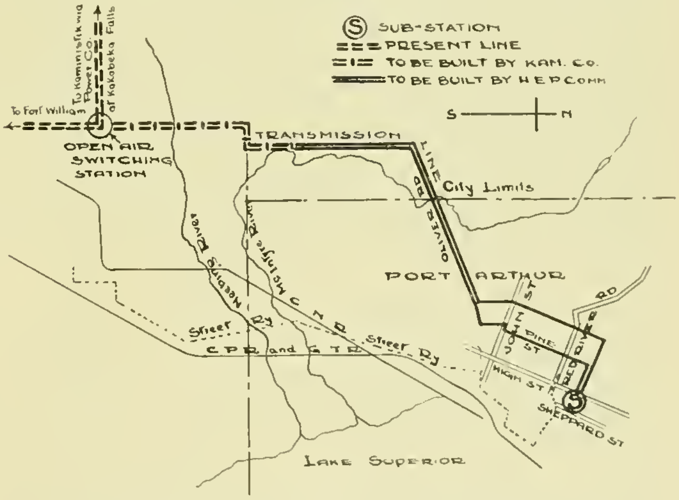
1. A saving of approximately 85 per cent. of the condensed steam for return to the boilers.
2. An increase of 100 per cent. in maximum capacity of plant.
3. An increase of 146 per cent. in economic capacity of plant.
4. An average improvement in economy of 13 per cent. over the best high-pressure turbine results.
5. An average improvement in economy of 25 per cent. (between the limits of 7,000 and 15,000 kilowatts) over the results obtained by the engine units alone.
6. An average unit thermal efficiency between the limits of 6,500 and 15,500 kilowatts of 20.6 per cent.

An Efficient Lighting Service

The Hamilton Electric Light Company is to be commended for its straightforward and business-like methods of dealing with the lighting complaints in Hamilton. Some half-dozen experienced men have been systematically canvassing the householders throughout the city, hearing complaints, asking questions, and making reports to head office with a view to learning the real opinions of the electric light users and if possible to remedying the imperfections in the service. It would appear that the company is doing everything in its power to make the lighting service efficient, one instance of which is shown by their offer to replace, free of charge, any incandescent lamp that may have become at all blackened. The complaint that monthly accounts are unduly large is, unfortunately, not confined to Hamilton. The remedy lies with the consumer, however, and not with the company, for the present day electric meter, however industrious it may be, can rarely be charged with more than the legal allowance of inaccuracy.

Port Arthur Power Lines

The accompanying figure will give an accurate idea of the layout of the transmission lines being installed by the Ontario Hydro-Electric Power Commission for the supply of power to Port Arthur. The Kaministiquia Power Company, generating at Kakabeka Falls, already transmits to Fort William. At a point on the Fort William line, shown in the figure, about nine miles from Port Arthur, an out-door switching station will be built and a double transmission line be led off towards Port Arthur. The first four miles of this double line will be built by the Kaministiquia Company, the remaining four or five by the Commission. For the most part those lines will follow the highway, one on either side.



Port Arthur's High Tension Transmission Lines.

Special provision is being made against lighting troubles, common in this district. Each pole line, carrying three transmission cables, will also be supplied with two protecting cables, one on the pole peak, the other on one end of the upper pole arm. These wires will be grounded every fifth pole. Unusual precautions are also being observed within the sub-station.

Current is transmitted at 25,000 volts and cut down, in the city sub-station to 2,200 volts. Rotary converters are also being installed to supply the street railway with direct current at 600 volts.

Regina will have Street Cars in a Year

The city of Regina, subject to the approval of the ratepayers, has granted a franchise to a Winnipeg syndicate, chief among whom are J. W. de Courcy O'Grady, James A. Anderson and John Geddes. From the items of the franchise it would appear that the city has driven a fairly hard bargain, though the tremendous possibilities for growth shown by most western towns in recent years will probably justify the company in its undertaking. Following are some of the conditions:

The franchise to be for twenty years, renewable at city's option, at that time or at the end of any future five-year period; streets used to be approved by council; no extensions to be made across city limits; location and type of poles subject to city engineer; style of car subject to council; police, firemen and postmen carried free; cars to operate between 6 a.m. and 11 p.m.; power house and all buildings to be within city limits. The company agrees to install bonding and return feeders; to keep roadway in repair 18 inches on each side of track; to remove snow 18 inches each side of track; to allow city use of their poles for transmitting electricity for light and power and for fire-alarm service; to operate Sunday cars at council's request. Seven miles of track must be in operation by May 1st, 1911. Freight may be carried on certain streets at certain hours, subject to council.

No fare is to exceed five cents. After five years, rate to be six for a quarter or twenty-five for a dollar. Children's tickets to be eight for a quarter until gross earnings are $6,000 a mile; after that ten for a quarter, and working men's tickets eight for a quarter.

On all yearly gross earnings of $8,000 a mile or over the company will pay 5 per cent; $9,000 and over, 7 1-2 per cent; $10,000 and over, 10 per cent; $12,000 and over, 12 1-2 per cent; $14,000 and over, 15 per cent.

Aluminum vs. Copper Cables

A current issue of the "Electrical Times," London, Eng., contains an interesting article on the relative values from many different points of view of aluminium and copper cable wire. The author discusses the problem in many of its complex phases, pointing out that much calculation and experimentation is necessary to determine what number and size of wires composing the cable will give the best combined result as to cost, tensile strength, weight and conductivity.

The following summary will give a fair idea of the relative values, as outlined in the article, of these two conductors, judged according to various standards of equality:

	Aluminium.	Copper.
Same resistance—Cross section	100	60
Same conductivity—Tensile strength	100	125 to 130
Same diameter—Weight	100	330
Same conductivity—Weight	100	200
Same resistance—Cost (raw material)....	100	170
Same resistance—Cost (manufactured) ...	100	147

Relative Resistances of Tungsten and Carbon

The electrical resistance of tungsten increases rapidly with increase in temperature; a wire having resistance 1 ohm at 0° Cent., increases to 7 ohms at 1000 degrees Cent. The rate of increase is practically constant throughout. This property of low resistance when cold explains the rapidity with which a tungsten filament becomes incandescent when a current is passed through it. The very reverse is true of carbon which has a resistance cold about twice as great as the resistance at incandescent heat. Under those conditions the current through the cold tungsten filament is much larger than normal, while that through a cold carbon filament is half of normal. Since the heating effect of an electric current depends chiefly on the amperage, being proportional to the square of this quantity, it is seen that the initial heat generated in the tungsten lamp is abnormally great and in the carbon lamp almost correspondingly small.

Calgary Power Company's Progress

Work on the 13,000 kilowatt installation for the Calgary Power Company is progressing rapidly. The power house is located on the Bow river at Horseshoe Falls near Kananaskis, about forty-five miles west of Calgary, and is now under construction. A fall of 70 feet will be obtained at this point. The generating plant will consist of two 2,500 k.v.a. 60 cycle three phase 12,000 volt generators, two 4,000 k.v.a. 12,000 volt generators, and two 175 kw. exciters. The transformers will consist of four 3,000 k.v.a. water cooled 3 phase units, 12,000 to 55,000 volts.

The generator turbines for the two 2,500 k.v.a. units and exciter turbines and governors are being furnished by the Jens Orten-Boving Company, of London, England. These consist of two turbines of 3,750 h.p. capacity under 70 feet head at 300 r.p.m. The Canadian General Electric Company expect to ship two 2,500 k.v.a. generators and the two exciters within the next few weeks. Orders for one 6,000 h.p. turbine, one 4,000 k.v.a. generator, for step-up transformers and switching equipment for the power house, and for step-down transformers and switching equipment for the Calgary substation will be placed at once.

A 55,000 volt transmission line is now being built to Calgary and a second line will be installed shortly. Contracts have already been closed with the Western Canada Cement & Coal Company, of Exshaw, Alta., and with the Alberta Portland Cement Company at Calgary to supply these industries with a total of about 4,000 h.p. The Western Canada Cement Company's plant at Exshaw is about eight miles from the power house and energy will be delivered at this point over a 12,000 volt two circuit aluminum line. Exshaw substation, which is nearing completion, will contain four 700 k.v.a. 3 phase water cooled transformers, stepping down from 12,000 to 600 volts. These transformers will be furnished by the Swedish General Electric Company. The switching equipment for the Exshaw substation is now in process of manufacture at the Peterboro works of the Canadian General Electric Company. Seven strand aluminum cable will be used for conductors on the transmission line to Calgary. This line will consist of forty foot wooden poles and will carry a telephone circuit and an overhead grounded wire for protection from lightning. It is expected that the plant will be put in operation during the coming summer.

Messrs. Smith, Kerry & Chace are engineers for the Calgary Power Company, and have charge of the design and construction of the plant.

April Meeting Toronto Section A.I.E.E.

The April meeting of the Toronto Section of the American Institute of Electrical Engineers was addressed by Mr. John C. Parker, of the Rochester Railway & Light Company, on the subject of "Industrial Power Work." The following are some of the points brought out in an excellent paper:—

"The industrial engineer's field is now much broader and more commercial than it used to be.

"At one time the industrial engineer's duties consisted principally in figuring the amount of power required to run certain machines, proper location of motors, belt speeds, etc. Now it involves general economics of manufacturing and business.

"Electrical power has given us a practical method of measuring the power required by different machines. There is really no other accurate method."

Mr. Parker made a plea for a higher standard of ethics in the engineering profession, both on the part of the industrial engineer attached to the operating company, and also on the part of the consulting engineer. The customers' interests should be looked after and they should be honestly advised to adopt the kind of power which will result in the greatest advantage to them, whether this results in increasing the earnings of the operating company or not.

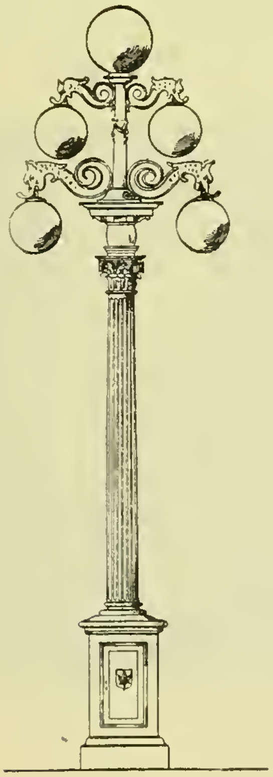
The discussion was opened by the chairman, Mr. Ed. Richards, and the following took part: Messrs. Sweeney, J. E. Bullard,

A. S. L. Peaslee, Robert Greenaius, N. S. Braden, P. W. Sothman, W. A. Bucke.

The next meeting will be held on April 29, and will be addressed by Mr. E. E. S. Creighton on the subject of "Lightning Phenomena." This will be the last meeting of the season nett & Wright Company.

Vancouver's New Street Lights

The plan of lighting Granville, Hastings, Cordova and Georgia streets and Westminster avenue by means of electric standards fourteen feet high, carrying five bulbs, on both sides of the thoroughfares, instead of by the present arc light system, has been before the city council for several months, and is now assuming definite shape. At the last meeting of that body City Electrician McCrossan explained that the property owners on the streets mentioned were willing to defray the cost of installing the standards on condition that the cost of up-keep and current be borne by the city. As this would mean an increased annual total expenditure by the city of $16,250 for Granville and Hastings streets and Westminster avenue, and $8,870 for Cordova and Georgia streets, less the cost of operating the present arc light system, which would be abolished, the wisdom of doing so has entailed much serious thought and discussion on the part of the civic fathers. The lighting plan calls for the erection on the four streets and one avenue mentioned of metal standards, 100 feet apart on both sides of the streets, each to be equipped with a top light, 100 watt, or 80 candlepower, and four lower lights, 60 watt, or 45 candlepower. The clusters would be similar in arrangement to those used in Seattle, except that the five lights on each standard would not be bunched as closely as those in the Sound city, and would be shaded by sand blast instead of ground glass globes, the former diffusing more light, while serving just as well to conceal the actual shape of the tungsten lamps within. The high power light on top would burn all night, while the other four would be turned off at midnight.

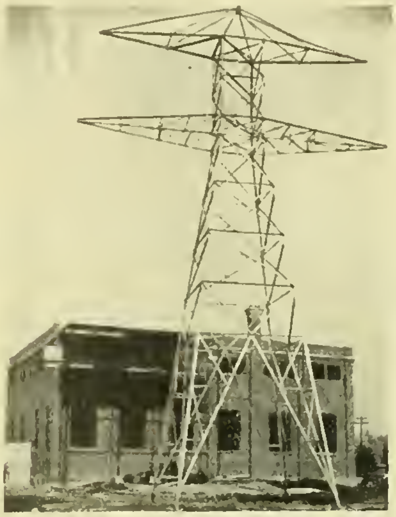


Lamp Post being installed in Vancouver.

The standards are 14 feet 6 inches from sidewalk to centre globe, and 10 feet 6 inches to the lower globe. The diameter at the foot of the column is 7 1-4 inches, tapering to 5 inches. The distance between the two lower globes is 3 feet 3 inches. The square base of the column is 1 foot 8 inches.

Strain Tower of Special Design

Rapid progress is being made in the Ontario Government transmission system, and power should be ready for delivery at certain points along the line during June. The accompanying photograph shows the condition of the Guelph station a month ago. Many of the substations, however, are more advanced than this, the Berlin equipment being practically complete. The tower in the foreground is the specially designed strain tower being used throughout this system. It is of the same general construction as the suspension towers, but has unusually strong reinforcements, designed to withstand the extra tension that will often be exerted at certain points along the line. The strain insulators to be used on these towers are also in appearance very like the regular type suspension insulator, but have been constructed to withstand nearly double, both mechanically and electrically, the strain required of the suspension insulator. The strain insulator will also contain ten units instead of eight as in the ordinary type.



Strain Tower used by Ontario Hydro-Electric Commission.

About 12 per cent. of the total number of towers, or in the neighborhood of 600, are constructed on the above special plan.

Nipissing Power Plant in Operation

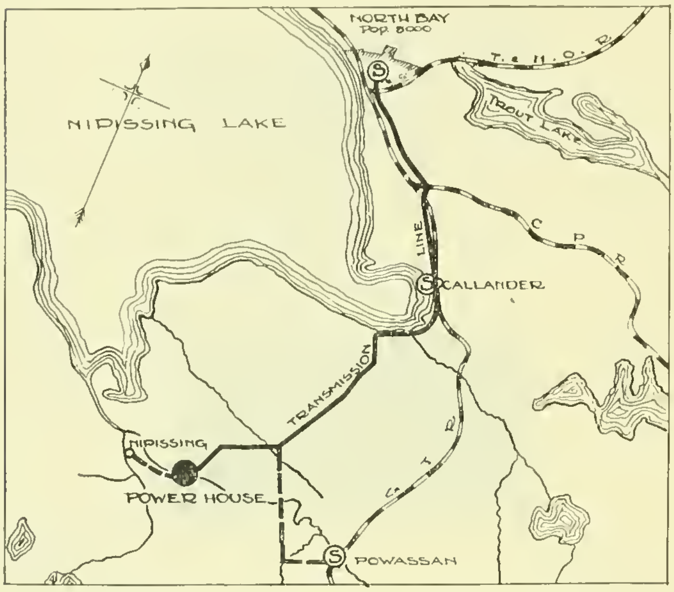
For the last two months the town of North Bay has been receiving light and power from the Nipissing Power Company's installation on South River, some 20 miles from North Bay. The location of the power house and transmission lines is shown in the accompanying figure.

The water supply is obtained by tapping the South River, some 2,500 feet above the power house, and water is led first by an open canal 900 feet long and then by a 6 foot wood stave pipe 2,000 feet long to the power house. Provision is made for a second and larger pipe to be installed in the near future. The storage pond above the diversion dam has a surface of about one hundred acres and is supplied by a drainage area of 350 square miles.

The present power house installation includes two 925 h.p. each 450 r.p.m. Jenckes turbines, to operate under an 86 foot head, each turbine being supplied with a Lombard governor; these are direct connected to two 450 kw. 3 phase 60 cycle 2,200 volt generators with a 12 1-2 kw. 125 volt direct connected exciter each on the end of the generating shaft; a 37 1-2 kw. induction motor-driven exciter set; three 300 k.v.a. single phase step-up transformers, 2,200 to 22,000 volts, delta connected. The plans provide for a further addition of another 450 kw. generator and 900 kw. generator.

The transmission line, about 20 miles long, consists of aluminum cable carried on wooden poles. A steel cable running along the pole tops acts as a lightning proctector and is grounded at every pole. A telephone line connecting the various parts of the system is carried by the same poles.

Power is already supplied to the North Bay Light, Heat & Power Company, which distributes throughout the town, and provision is being made for extensions of the service to Nipissing village, Powassan and Callander. As will be seen in the map, the main line passes through Callander, but a 22,000 volt extension is under way to Powassan, 6 miles from the power house; also a 22,000 volt line to the village of Nipissing, some 3 miles out from the generating station.



Nipissing Power Company's Transmission Lines.

The substation at North Bay contains three 450 k.v.a. oil insulated self-cooled single phase transformers, 22,000 to 2,200 volts. Two of these are Scott connected to give 2,200 volts, 2 phase, for distribution in North Bay; the third transformer is a spare and will form one of a second bank of two 450 k.v.a. transformers to be put in operation as the demand for power increases. Substations will also be built at Callander and Powassan.

All the electrical equipment, both for the power house and the North Bay substation, were furnished and installed by the Canadian Westinghouse Company.

In view of the favorable location of North Bay and its neighboring towns and their probable rapid increase in population and importance, the market for the power of this company will doubtless soon demand extensions to the maximum limits. North Bay, with its population of 8,000 people, is already a railway centre of importance, being fed by the C. P. R., the G. T. R. and the T. & N. O. Railways. The population of Powassan is about 1,000, and of Calander 600.

The engineering firm of Smith, Kerry & Chace designed and constructed this plant and are also now operating it.

Scott and Rubenstein vs. Midland Electric Co.

This was a dispute arising out of the careless handling of electrical goods on the plea that they were guaranteed by the manufacturer. The Court of Review decided in favor of the manufacturer.

The plaintiffs argued that as the goods were covered by guarantee it was not essential that they should take any steps to see that they were either handled in a proper manner or that they had not fulfilled the guarantee. The deciison of the Court demonstrates the fact that such guarantee by manufacturers does not relieve the dealer from taking ordinary steps to protect such manufacturers from having his guarantee abused.

Electric vs. Blast Furnace

The relative cost of electric and blast furnace production of iron is in the neighborhood of 4 : 3. The experiments on electric smelting are so very recent, however, that this comparison may be considered as quite favorable to the electrical method and with the ordinary improvements which usually follow the earlier stages of any manufacturing process it is easy to believe that a very few years may see this ratio increased. The superior quality of the electrical product, too, already in part outweighs its higher cost.

The Crocker-Wheeler Company's President

We have noted in previous issues the progress being made by the Crocker-Wheeler Company in their manufacturing plant in St. Catharines, and a few words of introduction to our Canadian readers, of Dr. Wheeler, the founder and president of the parent Crocker-Wheeler Company of Ampere, N.J., will be interesting at this time.

Dr. Wheeler was first connected with the Edison Electric Light Company as early as 1882 but later joined the manufacturing firm of C. & C. Electric Motor Company, New York, where he held the position of electrician and factory manager. This firm was among the first to place the manufacture of small motors on a scientific basis, and it was in no small measure due to Dr. Wheeler's natural inventive ability that these motors soon reached a state of efficiency.

The well-known Crocker-Wheeler Company was formed in 1888 by Professor Francis B. Crocker and Dr. Wheeler, with headquarters at New York. In 1893 the factories were removed to their present location at Ampere, N.J. During this time Dr. Wheeler also added to his duties that of expert to the Board of Electrical Control of New York, which position he held till 1895, when the work of putting New York's wires underground was completed.

Dr. Schuyler Skaats Wheeler.

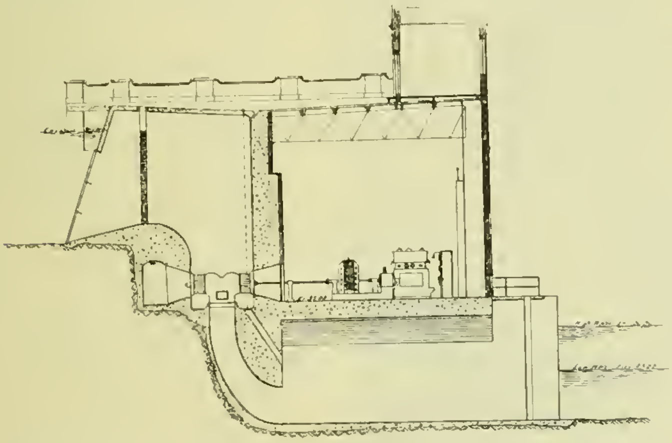
Dr. Wheeler is a past president of the American Institute of Electrical Engineers and a member of a large number of other scientific, literary and commercial societies. It will be remembered that his donation of the Latimer-Clark library to the A. I. E. E. a few years ago placed this society in possession of one of the rarest and most complete of early electrical works in the world.

Municipal Electric Installation for Renfrew

Will also Pump Water for the Town—Filters to be Used—Generators Made in Sweden—A Very Compact Plan

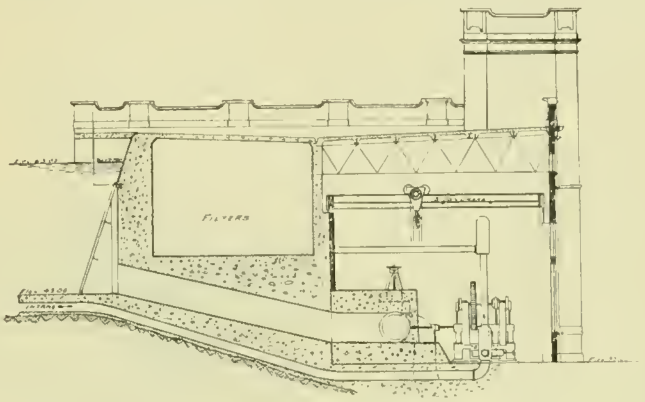
Plans are well underway for the installation of a municipal hydro-electric plant for the town of Renfrew, a short description of which will be interesting to our readers, for it is special in that the requirements put upon it will be somewhat varied. In addition to the hydro-electric development, a steam auxiliary will be installed for use in periods of low water or in cases of emergency. Also included in this plant is a pumping station to supply the wants of the town for water supply and fire protection.

The plant is situated on the Bonnechere river at the town of Renfrew. Intake is made at the new concrete dam, which is now under construction, right at the old highway bridge, see fig. 1. This dam is of the stop-log type and will serve as a means of regulation to the power house, located some 350 feet below. The headrace consists of two retaining walls running from the dam to the power house where two racks will take care of the needs of the generator turbines. A third rack will allow entrance of water to the concrete pipe underneath the filter room to supply the pumping turbines. A waste weir will be provided with crest elevations set three feet below the surface of the headrace water with regulating stop-logs. All water for town consumption, will be passed through pressure filters. The plant will be of reinforced concrete design throughout, very compact, every available foot of space being utilized. Wing dams are provided in the tailrace as shown in fig. 1, which indicates the general layout of the plant.



Cross Section Renfrew Plant Showing Turbines and Generators.

To cope with the above wants the following apparatus is to be installed: Two horizontal, centre discharge, reaction turbines, to operate, under a 36-foot head, each to develop 500 h.p. at full gate and a speed of 400 r.p.m. These in turn will be direct connected to two Swedish General Electric alternators, each of 250 kw. at 100 per cent. p.f., 400 r.p.m., 60-cycle, 2-phase, 2,300 volts, revolving field water wheel type. To the end of one of the above generators, direct connected by means of a special coupling, which may be disconnected at will, will be a Belliss Marcom patent self-lubricating, two crank, compound engine, engine to give 290 b.h.p. when running at 400 r.p.m. steam at 110 pounds pressure, noncondensing. Two exciters will be installed, one direct connected, the other belted to shaft, and each capable of exciting both machines. Lombard governors are to be provided for regulation of the generators.



Cross Section Renfrew Plant Showing Pumping Apparatus.

The pumping units will consist of two vertical double acting pumps, each with a capacity of 1,500,000 gallons per day, direct connected to single runner turbines mounted on a horizontal shaft in a cast iron pressure case, operating under said 36-foot head, each to develop 150 h.p. at speed of 360 r.p.m.

The switchboard will consist of eight panels of blue Vermont marble, 2 inches thick by 65 inches high with sub-base of 24 inches, to be used as follows: One lighting panel, two power panels, one arc lighting panel, one exciter panel, two generator panels, one blank panel.

Mr. John B. McRae, consulting engineer, Ottawa, is retained as engineer for the town of Renfrew in this installation.

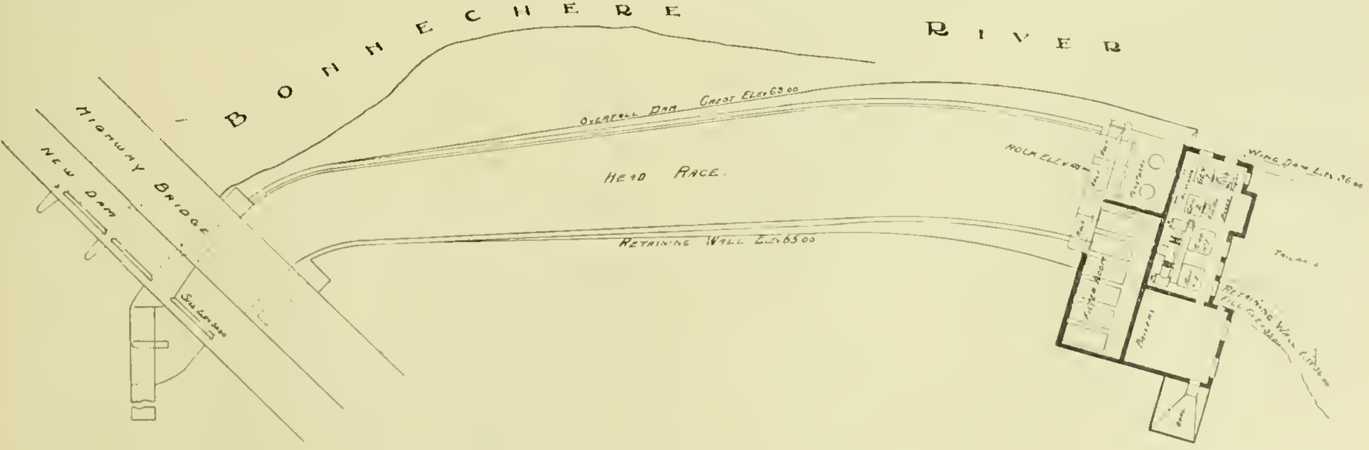


Fig. 1—General Plan of Renfrew Municipal Power Plant

The Makers of Electrical Canada — 1

WILLIAM MACKENZIE—THE BUILDER

In the mind of the average man the subject of our sketch is probably more closely associated with "a mile a day for twelve years" representing an almost superhuman achievement in steam railway construction, for which William Mackenzie was chiefly responsible, than with any other of the varied activities that may be coupled with this name, and yet William Mackenzie has shown himself at least as great a financier as a railroad builder and probably has achieved an even higher success in electric traction construction and operation than in either of these. For this reason it is deemed fitting at this time to pay a few words of a tribute to the one who, more than any other living man has fought and labored to make "electrical Canada" a byword for progressiveness and excellence.

Mr. William Mackenzie.

It is probably unnecessary to tell our readers that William Mackenzie was born in Kirkfield, Victoria County, Ontario, or that he is of pure Scotch descent, his father and mother being both natives of the Highlands. The "growing time" in Canada which he has always forseen more clearly than any other man, constrained him to turn his attention to railroad work, his first contract being for the construction of what is now known as the Midland division of the Grand Trunk. As Canada grew in wealth and importance so William Mackenzie, the successful railway builder, enlarged his operations, until to-day his latest achievement, a transcontinental railway, stands without parallel in the annals of the whole world of what one man has accomplished practically single-handed. In this connection it is only fair to say that in this latter work Mr. Mackenzie's fortunate insight into human possibilities had led him to associate, with himself, as partner, Mr. D. D. Mann, who, in his own particular sphere of "doing things," very possibly stands unparalleled in Canadian history.

But the construction of a mile of railroad a day was not enough to keep this builder's time sufficiently occupied and in 1890 he turned his attention to the very unsatisfactory condition of the Toronto Street Railway then operating as a tram system. While others thought about these conditions, William Mackenzie acted, secured a franchise, provided the funds and successfully operated the first street railway in Canada. More than that, the franchise under which he chose to risk so much, stands to-day as giving more liberal returns to the citizens than any similar Canadian system and, though the first, has never been excelled by later constructions in any Canadian city, and within the year has been pronounced by the highest engineering authorities equal in efficiency and construction to the best in America. Montreal street railway conditions simultaneously occupied Mr. Mackenzie's attention and to him, in no small measure, the success of this line system is undoubtedly due. Later he withdrew from the management in Montreal and, forseeing the progress Winnipeg was destined to enjoy at a time when few had faith in western possibilities, has gradually evolved a system of urban and suburban lines over 100 miles in length, and has built a hydro-electric plant, of which an eminent Canadian consulting engineer has recently said that it is equal to anything of its kind on the continent. In addition the electric and gas lighting systems of Winnipeg are also under the control of the same management

Perhaps no more striking example can be found of Mr. Mackenzie's interest and confidence in electrical operations and of the ease with which he accomplishes what other men find impossible than the formation two years ago of the Toronto Power Company. At that time of great financial depression the Electrical Development Company, of Niagara Falls, and the Toronto and Niagara Power Transmission Company found themselves so pressed for funds that it is doubtful if operations could have been continued. The plan of leasing these lines to the Toronto Power Company, which was formed for this purpose, and which should operate both the generating and the transmission system and also assume the financial liabilities of both, worked magic results under the master hand, and to-day both these systems operate again at a good profit, and the securities, which for a time threatened to be valueless, are rapidly, under Mr. Mackenzie's guarantee, showing appreciative values. Had these companies ceased operations at that time the loss to Toronto alone could not have been estimated, and that city unquestionably owes to Mr. Mackenzie no small debt of gratitude that her progress at a critical time remained uninterrupted.

A Recapitulation.

It is not the intention of this short review to attempt to describe all the electrical undertakings with which William Mackenzie has been intimately associated, but some estimate of his contributions towards the development of the science of electrical operation may be formed from a simple summary of the various enterprises, both at home and abroad, in which he holds prominent offices. In addition to the Toronto Railway and Winnipeg Railway systems, and the Toronto Power Company, already mentioned, over all of which he is president, Mr. Mackenzie is also president of the Toronto and York Radial Railway with its nearly 100 miles of suburban lines; vice-president of the Electrical Development Company; and is on the board of the Canadian General Electric Company, and of the Shawinigan Water & Power Company. Through the Canadian Northern Railway, of which it is a subsidiary, Mr. Mackenzie also controls the destinies of the Niagara, St. Catharines & Toronto system operating in the Niagara Peninsula. Away from home he is president of, as he has been the chief factor in, the Sao Paulo Tram, Light & Power Company, which operates not only the street railway system, but also controls the light and power distribution of the city of Sao Paulo, which is about the same size as Toronto; also he is president of the Monterey Railway, Light & Power Company to which are subsidiary the tramway company, the electric light and gas companies, the water distribution system and the sewage system. And last, he is also the presiding genius over the Rio de Janeiro Tramway, Light & Power Company which, with its control over the tramway system, the lighting system, the gas distribution system, the telephone system, and the power distribution system, with its present hydroelectric development of 50,000 horsepower and its ultimate capacity of 200,000 horsepower in a city of one million inhabitants and with a capitalization of fifty million dollars constitutes, we believe, the largest electrical operating company in the world at the present time.

The Other Side.

If one may judge of William Mackenzie's chief characteristic by the verdict of "the street" it is his capacity for working quietly. Although there is no one man in our midst who accomplishes so much, there is rarely any outer evidence by which one may know what is transpiring, no advertising, no promises, only results. This characteristic of apparent secretiveness is probably nothing more than complete absorption in his work, but, nevertheless, this entire lack of ostenation makes it impossible for the casual observer to gauge the other side of his character. A little incident, however, which shows the keenness of Mr. Mackenzie's interests in electrical matters, though often outside his own particular sphere, came under the notice of the writer some years ago while a student at Toronto University. It was in the days following the discovery of "radium" when every scientific student the world over was pondering ways and means to provide himself with a small fraction of a grain of that rare substance that he might prosecute further research into his unusual properties. Toronto University in those days was less rich than now and the request for a few hundred dollars to purchase a quantity of matter that required a microscope to locate it, was firmly refused. Even the University authorities apparenty did not foresee the tremendous possibilities in the following up of this discovery; but William Mackenzie with others, learning of the situation, did, with the result that the laboratory got radium in plenty and the university was thereby enabled to keep pace with the other centres of learning in the race of discovery that followed during the following months.

Mr Mackenzie's more recent donation—to mention one more case—to Trinity University for the foundation of open scholarships, irrespective of denomination, further illustrates as well his breadth of mind as of interest.

Success is,—System, Tact, Loyalty, Work

The Plan of Operation Adopted by a Large and Prosperous Electric Company in the Prosecution of Its New Business—By the Chief Sales Agent

Territory.—Separate territory is assigned district agents who have under them one or more sub-agents, who are expected to report in writing direct to the district agent on the cards which may be secured from the department clerk when required. These cards contain complete information regarding every prospect called upon, and are filed daily, and returned to the respective agents, as per their instructions and return call dates. District agents are responsible for the territory assigned them. They are responsible, as well, for the work of the sub-agents. The district agent works preferably among the business parts of his district, leaving the residential territory to the sub-agent.

Cards.—Cards are made out at night after returning to the office, or preferably while the agent is on the territory. They must be on the chief's desk at 8.30 a.m. No reason, unless absence from work, excuses a man on this point.

Solicitation.—The districts are thoroughly canvassed, street by street, house to house, store to store, shop to shop, factory to factory. Every building in the district must be visited and a complete report, as per instructions on cards, returned. The said canvassing is done preferably in the morning, when, in the residence districts, the women will be found at home, and in the mercantile districts the stores are not as a rule crowded, and the merchants are not so very busy. Call-backs are made, preferably, in the afternoon. The agents, however, use their own judgment regarding this matter.

Concentration.—One street is canvassed at a time; one section of a district. System is used. Absolutely no results can be secured unless a man systematizes his work.

Specialists.—Industrial heating specialists, power and sign specialists, and others, as may be found necessary, are employed.

Information.—If any is desired regarding any subject whatsoever, same is put in writing and handed to the district agent, who in turn sees that the information is secured, and advises the chief of the department at the time. Lighting solicitors do all in their power to secure business of whatever nature might present itself, or may be worked up by them. The power specialists assist to the best of their ability. If there is any information not on file in the office, it is secured. Every man is to feel that he is part and parcel of a great corporation, and that his interests are theirs, and their interests are his. A salesman necessarily lives in the present. The past is always dead so far as the solicitor or salesman is concerned, and the future is always before him.

Suggestions to the New Solicitor.

Hugh Chalmers, of the Chalmers Detroit Company, who was for many years sales manager of the National Cash Register Company, at a salary of $72,000 a year, has said that it did not matter what a man did, or what he was going to do, its what he is now doing daily. What a man's employers are in is the present. The dynamos at the different sub-stations must turn daily and nightly, and the human dynamos of the sales department of an electric company are expected to turn daily and nightly to find a market for the generating of the machines of their plant.

The difficulty with the average salesman seems to be that he won't work, and if a man intends to make success of this or any business, he must work. If he is ambitious and has enough rich, red blood in his veins, and enough vim to keep up the fight until he is among the head liners of his class, he is bound to win out.

One of the most successful canvassers I ever knew started in the central station business as a flat iron salesman. He made it a point to visit every house in his district where electricity was used, between certain hours of the day, and he placed more irons than any two men in the company's employ. Later he was put on house lighting, and met with the same success. He told me he secured his business by making a set canvass every morning, if possible. He visited every house in his district, including customers, suggested the use of appliances to them, and was able to secure business from non-consumers. His whole success lay in systematic work.

Many of you may feel that canvassing is demeaning. It is not. Timothy Eaton in his day did not think so. He canvassed with the newspapers. The Robert Simpson Company pursue the same method of canvassing. Every great mercantile concern in the country has made a success through canvassing. If you know your business and are qualified, you can enter every house in your territory, and in time you will be gladly received as a social equal by people to whom you introduced yourself as a solicitor or agent from the local electric company.

In putting gentlemen who have had no former experience, in the residence districts, we give them an opportunity to learn how to sell electricity. The experience will be of incalculable value to them when they go into the business district. A man should feel that he is of just as much value to the commercial world, securing the business of wiring residences, or the installation of flat irons, or any other appliance, as if he was selling motors, locomotives, or engines. Every man who makes good in his district is to consider himself in line for promotion. There will be absolutely no favoritism shown. The salesman will be judged on the work in the district. No matter how poor the district, a man must secure some business from it, who can honestly say to himself, "I have been assiduously working the territory."

Every man should feel that he is the company. The company is judged by his actions. The salesman is the tie that binds the public service corporation to the public. It is possible for a man to so carefully handle the people in the district that they will swear by him and refuse to do business with any other employee.

On the sales force of an electric company are men who have clientele who swear by the corporation, secured only by painstaking labor and knowledge of the business peculiar to the needs of their clients. It is our aim, gentlemen, to make this one of the greatest sales organizations on the North American Continent. We have the timber, and we intend to fashion it, to season it, and to turn out finished stock which will be the pride of the company and the example of every central station in Canada

The opportunities for advancement in this business are greater than in any in which a man might engage. George Williams, Henry L. Doherty's chief salesman, who has probably put a greater number of electric plants on a paying basis than any man in the business, was a young Canadian who, finding himself broke in Chicago, got a job driving a truck for a gas range manufacturing company, and, finding that there was more money in selling gas ranges than in hauling them, he started out to learn to sell them at a salary of $40 per month. He went from house to house and got business, and in less than a year he was worth $40 a week, and is probably now getting twice that or more.

H. S. Montgomery, general manager of the Auburn Light, Heat & Power Company, entered the Doherty employ at Denver, Col., when he did not know the difference between a kilowatt and a pint of oil. In four years' time he was business manager and put the Auburn Company on its footing, and is now general manager of that concern at a very high salary.

I simply mention these examples of what a man can do with himself, to show you that it is not necessary to remain always a sub-agent, but that you can advance more rapidly in the sales department of the company than in any other.

Let us start together, every man with his toe to the mark, with determination to make the present year a banner one in our company's history. Let every man do his utmost to have the sales department one of the most successful on the North American Continent, second to none and far ahead of the majority. It is up to you, gentlemen. Your success means more to you than you have any idea. We have set out to win, strong competition is against us, and win we will.

"In the lexicon of the sales agents of an electric company there should be no such word as fail."

Methods of Compounding Alternators

By Prof. L. A. HERDT, E. E., Ma. E.

For convenience of reference, the following divisions have been made:

1 Armature reaction and armature reactance.
2 Compounding.
3 Applications.
4. New method for compounding of alternators

Armature Reaction and Armature Reactance.

When an alternator supplies a current dephased by an angle ϕ with respect to the internal induced electromotive force, the armature reaction may be considered as made up of two components, one a direct reaction produced by the wattless component of the current ($I \sin \phi$), the other a transverse reaction due to the watt component of the current ($I \cos \phi$). This principle was laid down by Blondel in 1899.[2]

The relation of electromotive forces and current in the armature of an alternator under load is given in fig. 1.

OA = no load e.m.f. E_0 set up by the field flux ON due to the constant field magnetomotive force.

OM = AB = counter e.m.f. set up by the flux OH due to the quadrature component of the armature current.

BC = reactance e.m.f. set up by the inphase component of the armature current.

OE = CD = leakage reactance e.m.f. set up by the armature leakage flux.

OF = DV = ohmic drop due to the armature resistance.

OV = the terminal volts.

OI = the armature current.

ϕ = angle of phase lag between E_0, the no load e.m.f. and the armature current, OI.

θ = angle of phase lag between the terminal volts and the armature current.

Neglecting the ohmic drop, which is usually very small, that is, assuming CV = CD, the total armature reaction causing the drop of potential under load is equal to the resultant of AB, BC and CD, or to the resultant of AB′ and B′V, respectively equal to $(x_1 + x_2)\,I \sin \phi$ and $(x_2 + x_3)\,I \cos \phi$, when $AB = x_1\,I \sin \phi$, $BC = x_2\,I \cos \phi$, CD or $CV = x_3 I$; that is, x_1 is taken as an equivalent reactance for the quadrature component of the armature magnetomotive force, x_2 a reactance for the inphase component of the armature magnetomotive force, and x_3 the leakage reactance of the

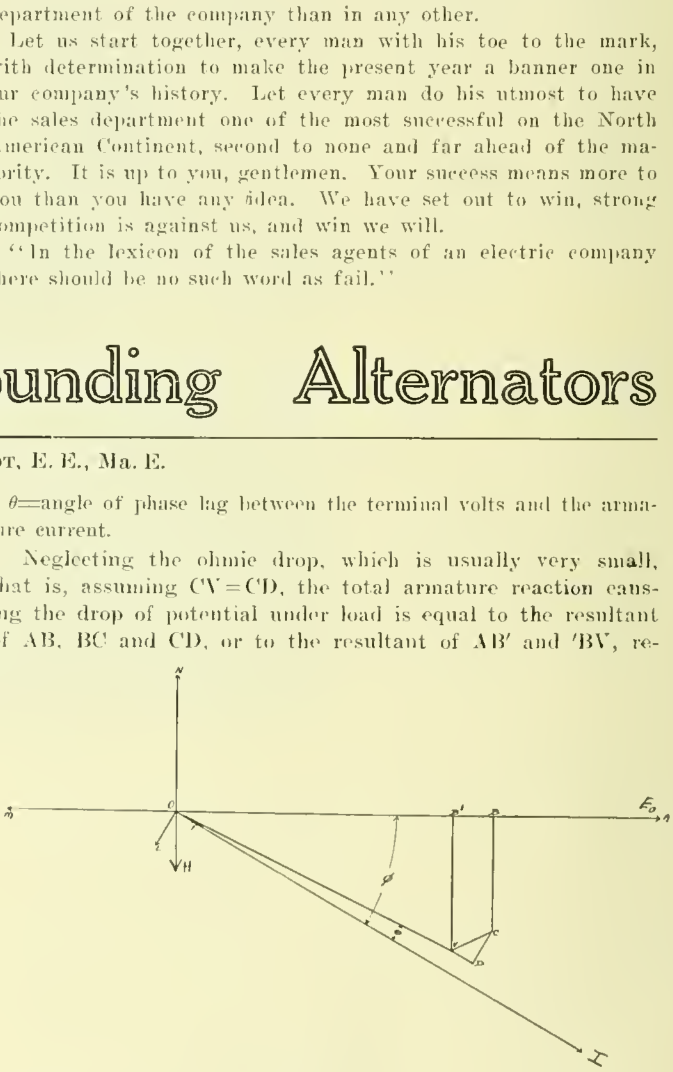


Fig. 1.

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[1] This article is a summary of a paper by J. E. Dalemont and L. A. Herdt published in "The Electrician" London, England.

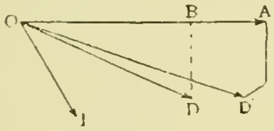
* See L. A Herdt, Armature Reaction in Polyphase Alternators "Electrical Review" December 1905.

armature windings. The determination of x_1, x_2 and x_3 has been discussed by many writers to whom the reader may easily refer.

If (x_1+x_3) were equal to (x_2+x_3) the total armature reaction would act as a system of poles equal in number to those of the field poles, and the intensity of the field thus set up would depend on the load current, while its position relatively to that set up by the field poles would depend on the angle of lag between the no load e.m.f. and the current. Although (x_1+x_3) may not be equal to (x_2+x_3), since these values are multipled—the first by I sin ϕ to give the total direct armature reaction, the second by I cos ϕ to give the transverse armature reaction—the difference existing between them is not of great importance.

Compounding.

The compounding of alternators to obtain constant voltage under variable load and character of load has taxed the ingenuity of many inventors, and many devices and systems to obtain this end have been brought forward. A list of the best known attempts will be found in Appendix II. of a paper entitled "Reaction d'induit et compoundage des alternateurs" by the writer and Prof. Dalemont, before the "Societe Internationale des Electriciens" in December, 1909. In 1896, Blondel, before the Geneva Electrical Congress, indicated the advantages to be derived from compounded alternators; Leblanc in "La Lumiere Electrique" has shown that alternators with small inductance in the armature, built for close regulation, were not economical, and quite recently McFarlane and Burge[3], in "The Electrician," have shown by typical examples how poor is the utilization of material in alternators and what could be done to improve the output of these machines. The heavy weight of alternators per kilowatt of output is due to the fact that to obtain close regulation it is necessary to use a large value for the ratio of field ampere turns to armature ampere turns.



Fig, 1. a.

The aim of this paper is to indicate what the writers believe to be a new and simple method to obtain the compounding of alternators. The writers are aware of the fact that for large units operating under steady loads a regulator, type Tyrill or other, gives very good results to maintain constant voltage at the terminals; still, there are a large number of cases where a compounded alternator could be used with great advantage.

It has been stated that the total armature reaction causing the drop of potential under load was made up of two components. To maintain a constant terminal voltage it would, therefore, seem necessary to compensate for those two components. This could be done by setting up two magnetic fields, one acting on the magnetic circuit of the normal excitation and having a magnetomotive force varying as I sin ϕ the other acting at 90 electrical degrees to this first one with a magnetomotive force varying as I cos ϕ. It should be noted, however, that if in fig. 1, the component AB′ works against the induced e.m.f., the component B′V has a tendency to help, but its great effect is to introduce a shift of phase of the terminal voltage, while it has practically no effect in its value.

If, then, the direct armature reaction AB′, due mainly to the wattless component of the armature current, is alone considered, this reaction being compensated by a field acting directly on the poles and varying proportionately to I sin ϕ, the terminal voltage would be given by OD¹, fig. 1a. For different values of ϕ and of I the point D¹ would be displaced considerably, but the length of OD¹ would be approximately equal to that of OA, the no load e.m.f.

Compounding of alternators can therefore be obtained by compensation of that part of the armature reaction which produces the drop of terminal voltage, and may be obtained by simply placing on the field poles of the alternator additional ampere turns producing a magnetomotive force proportional to I sin ϕ.

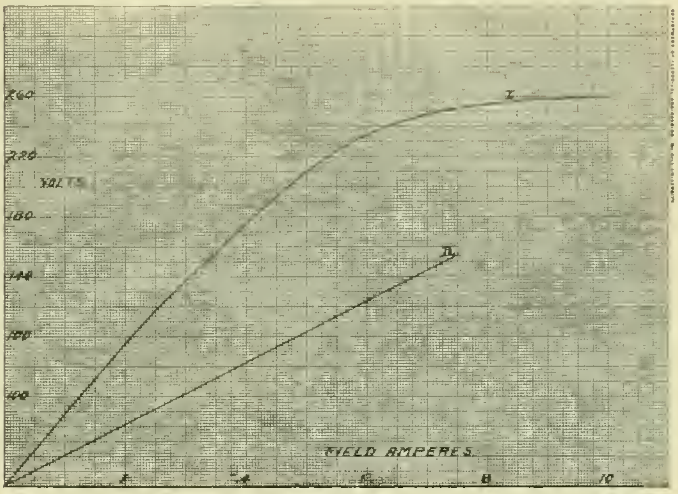
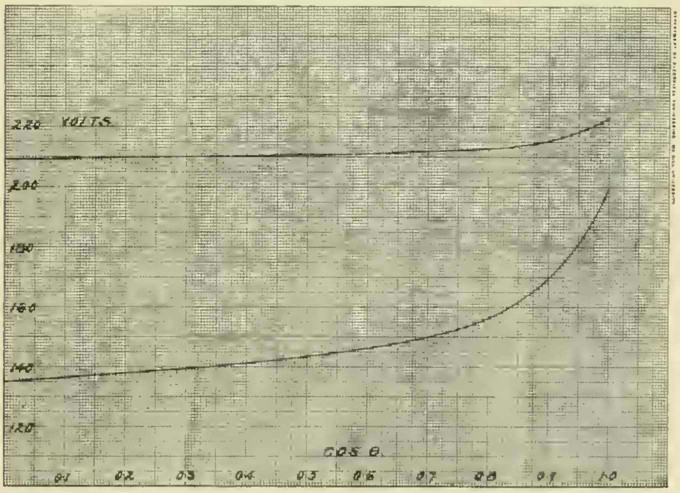


Fig. 2.

Applications.

An application of this method of compounding was made by the writers on a revolving field alternator at the electrical laboratories of McGill University, Montreal. The machine experimented upon is a three phase, 60 cycle, 220 volts, 1,200 r.p.m., 15.2 k.v.a. alternator. The no load saturation and short circuit curves are given in fig. 2.

Curve 2, fig. 3, gives the terminal voltage at full load current and different power factors under constant field excitation and constant speed. It will be noted that the terminal voltage drops from 203 volts for cos $\theta=1$ to 134.5 volts for cos $\theta=0$. Cos $\theta=0$ corresponds to an angle of lag ninety degrees, between terminal volts and current; it is also the angle of lag between the no load e.m.f. and current x_1+x_3 can be determined from this point on the curve, that is, the alternator working on a purely reactive load with known angle of lag equals ninety degrees between terminal volts and current; it is also the angle between no load e.m.f. and cur-



Fig· 3.

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[3] McFarlane and Burge, The "Electrician" Vol. lxii page 390, December 1908.

rent; x_1+x_3 in this particular case was equal to 3.72 ohms. x_2+x_3 can also be determined from the curve when $\cos\theta=1$, that is, when the external circuit lag angle $=0$, since $E-I(x_1+x_3)\sin\phi=V\cos\phi$, and $V\sin\phi=I(x_2+x_3)$. In this case x_1+x_3 was found equal to 2.32.

To determine the values of x_1, x_2 and x_3 only two tests, therefore, are necessary; one at full load current and full excitation operating on a purely reactive load to obtain x_1+x_3, the other at full load current and full excitation on a non-inductive load to obtain x_2+x_3. In this second test difficulties will ordinarily be met with that will render the test impracticable. The best methods of determining separately x_1, x_2 x_3 were recently pointed out by K. Haga in a paper published in "La Lumiere Electrique."[4]

The terminal volts for full load current $I=40$ amperes and for the different values of $\cos\theta$ after compensating for $Ix_1 \sin\phi$ have been calculated and are given in curve 1, fig. 3 This curve shows that while the drop of voltage at full load current varied by 36 per cent. as the power factor changed from 100% to 36%, this drop of voltage, under similar conditions of load, changed only 6% when the component of armature reaction $I.x_1.\sin\phi$ was taken care of.

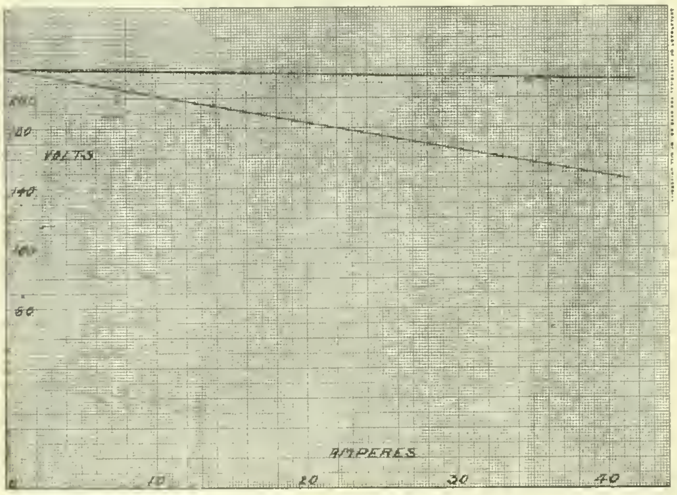

Fig. 4,

Working out in the same way the terminal voltage at constant power factor of load, viz., 67%, we may ascertain the different values of this voltage where the load current varies from 0 to full load. Fig. 4 shows this voltage at the terminals with and without compensation for $I.x_1.\sin\phi$, where curve 2, is the terminal voltage without compensation, curve 1 the voltage after compensation. The regulation is from no load to full, equal to 3.5%, that is, one-tenth of the regulation obtained with constant field excitation. The experimental curves obtained as a check of the calculated values of figs. 3 and 4 were so close to the calculated values that it was not necessary to reproduce them.

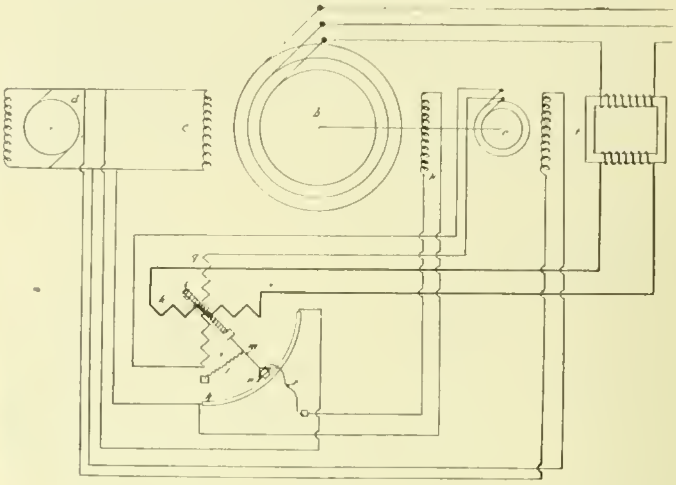

Fig. 5.

New Method for Compounding Alternators

The principle disclosed by the previous discussion is simply to cause a current proportional to $I\sin\phi$ to pass through extra turns, X, placed on the poles of the alternator, fig. 5. It is intended to use for this purpose a system of two coils, g and h, fig. 5, at 90°, in which two currents out of phase upon one another by an angle ϕ will be set up. Inside these coils will be placed a rotor, and the torque set up by the induced currents in same from the resultant field of the two coils will be proportional to $I\sin\phi$, if in one of the coils flows a current proportional to and in phase with the load current of the alternator and in the other coil flows a current proportional to and in phase with the no load induced e.m.f. of the alternator. This last current can be obtained from a small auxiliary alternator e, giving an e.m.f. exactly in phase and proportional to the e.m.f. of the alternator to be compounded. This system of coils, g and h, which is simply a phasemeter (Dobiowolsky system), will work on a lever in which, by taking a defined position for each value of the torque set in it, proportional to $I\sin\phi$, will introduce a direct current in the additional coils placed on the field pole to vary as $I\sin\phi$.

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[4] K Haga — Determination experimentale des Reactions d'Induit, Lumiere Electrique Tome VII, 1909.

The Latest Improvement in Nernst Lamps

By A. E. Fleming

Within a period extending over the last five years, the electrical interests have witnessed great activity in the direction of improved efficiency in station equipments and distribution systems, and rapid progress has been made in the means of converting electrical energy into light, and in the efficiency of application. While it is probable that many readers are more or less acquainted with the old Nernst lamp, not only in its general construction, but also in the electrical characteristics of its elements and the history of its development, still it may be well to touch briefly upon these points that comparisons with the later product may be more forcibly brought to your attention.

In the development of high efficiency lamps, the appearance of the a.c. Nernst lamp in America in 1901 marked the first step in high efficiency in a commercial lamp, and further gave that high efficiency in incandescent units of larger size than was the practice at the time, thereby filling the existing gap between the carbon incandescent and the arc.

Notwithstanding the rapid appearance of the various vacuum high efficiency lamps, the demand for a.c. Nernst lamps steadily increased, and in 1907 the d.c. lamp was placed on the market; not, however, until laboratory investigation and one commercial installation of 1,500 units operating for nearly two years showed that the d.c. lamps could be manufactured for successful operation. About a year ago, a lamp showing a gain in efficiency of 37 per cent. was available for both alternating and direct current circuits; and at present a still higher efficiency, in the Westinghouse Nernst lamp so named in order to distinguish it from the old and now obsolete designs, is the standard product.

The Westinghouse Nernst embodies over the Nernst lamps of the old design, an increased efficiency, a greater variety of sizes, a simplified maintenance of renewal system, improvements in mechanical construction, and also maintains the additional characteristic features of the old lamps, namely, low maintenance cost, natural downward distribution of light, absence of flicker, and adaptability to artistic fixture design.

The development of the Nernst lamp from its original crude, unreliable state, when first introduced in America, into the efficient, practical, neat appearing commercial lamp of the present day, involved the solution of serious difficulties which were encountered at each step forward. The skill of the scientest and chemist was taxed in the problem of separating the rare elements from the earth, and combining them in such proportions as to give the desired performance. The electrical engineer solved the complex electrical problems presented by solid electrolytes and high temperature conditions in the circuits, and arranged the elements so as to give high efficiency; while the mechanical engineer and designer were taxed to produce a design which would fulfil commercial requirements, and at the same time lend itself to any architectural treatment.

The Glower.

The glower, or the light emitting element, is the distinguishing feature of this lamp. It is made by pressing through a die, a dough composed of the oxides of rare earths mixed with a suitable binding material, cutting the porcelain-like string thus made into proper lengths, drying, roasting, and finally attaching the lead wires. It is about one inch long, 1-32 inch in diameter (the exact size depending upon voltage and current) and is about as strong as a piece of porcelain of like dimensions, and in short sections, is rather difficult to break.

At ordinary temperatures, the glower is a non-conductor, but becomes a good conductor when heated to about 700 degrees Cent. Since it is an oxide, and not readily capable of further oxidation, it can be operated in the atmosphere at a very high temperature. However, as temperature has a direct bearing on efficiency, it is desirable to operate the glower within a globe, where the heat liberated is more or less confined.

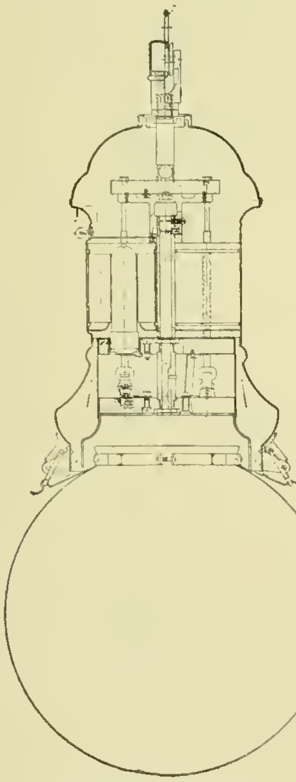


Fig. 1—Sectional View of Multiple Glower Nernst Lamp.

In the new lamp, the glower has been improved mechanically and electrically. The addition of certain radio-active materials in the glower itself results in a more uniform candle power performance. A new terminal design materially reduces the losses due to the Peltier effect, and therefore provides a longer lighting length between the terminals for the same voltage; and the use of a hollow glower instead of a solid rod, as was the former practice, provides a greater light-emitting surface for the same current. The combination of these features results not only in a higher efficiency, but also in a better individual life performance; an advance which is of much greater importance than any corresponding increase in average life.

The normal limits for operation of standard glowers are from 200 to 260 volts. Of the various units, the Nernst system as now marketed consists of six units for use on both a.c. and d.c. of 220 volts for indood and outdoor service, which are properly termed 88, 110 132-watt single glower, 2-glower, 3-glower and 4-glower lamps.

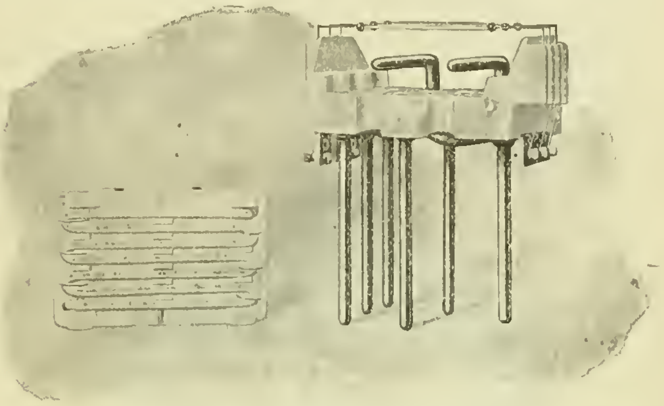


Fig. 2.—Water Heater and Holder.

Three Classes of Units.

The Westinghouse Nernst may be classified under three heads: multiple glower units, single glower units,and chandelier units.

Multiple Glower Units.—The mechanical construction of the multiple glower lamp presents a design which combines simplicity and compactness. (Fig. 1.) The exposed terminals and supporting hook have been replaced either by a fixture nipple or a small hook, through which the service wires enter the top of the lamp housing and terminate in two binding posts in the body of the lamp.

The holder of the Westinghouse multiple units presents a radical change in design. The use of two or more water tubes is superseded by a ''Wafer Heater' (Fig. 2), a heater consisting of a small platinum-wound cement coated rod, bent so that several sections lie parallel to the glowers and securely mounted on a flat porcelain. The wafer slides on the heater prongs when inserted in the holder;the heater terminals being in the form of a sleeve contact. Hence it will be noted that heaters can readily be changed without tools and without disturbing any other member of the lamp.

An improved method of supporting the globe is employed so that the glassware can be removed instantly, and at the same time is locked to the lamp body, thus minimizing both labor in cleaning and breakage due to careless handling.

Single Glower Units.—The various sizes of single glower units are of the Edison base type (Fig. 3), and present a similar appearance to the old popular 110-watt unit, although the construction is a unique departure from former practice. The cutout is located within the Edison base (Fig. 4), immediately under which is the ballast secured by means of bayonet catch. Three prongs lead to the base porcelain, the lower side of which forms the Nernst receptacle.

The holder (Fig. 3) consists of a glower and wafer heater permanently connected on a small porcelain provided with a standard screw base, with an additional contact pin in the centre. By an assortment of diameters and lengths of contact pins, it is impossible to insert any other than the proper holder in the lamp, thereby insuring the consumer against troubles incident to the use of lamps of various sizes and voltages.

The Chandelier Units. By reason of the natural downward distribution of light, the wide range of sizes, and the simple system of renewal the lamp offers great latitude in artistic fixture design. A departure from former fixture practice is present in a distinctive design of Nernst chandelier units (Fig. 5). Heretofore, the complete single glower lamp was used in a pendant position in ordinary fixtures, but in many cases the appearance of such a combination did not harmonize with the architectural features. The new chandeliers are constructed with the ballasts and cutouts in the body, so that the Nernst receptacle forms the socket into which the screw burner only is placed. In this design, the lamps may be operated in any position, and a lamp presenting to the eye only a 3-inch ball, will lend itself to artistic effects without limit and still provide efficient illumination. These chandeliers are made of both spun and cast bronze for use with any size of single glower lamps.

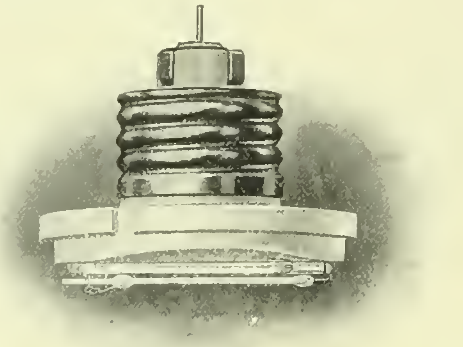


Fig. 3—Screw Burner with Globe Removed.

Effective Distribution of Light.

The natural downward distribution of light from the new Nernst lamp is shown in Fig. 6, which is self-explanatory. The peculiar softness and low instrinsic brilliancy obtained by the use of light alabaster glassware, despite the fact of a concentrated source and a downward distribution, has a pleasing effect on the eye. Exhaustive tests on the performance of glassware indicate that light alabaster glass is but slightly diffusing, and therefore, does not materially change the character of the distribution curve. The loss of light due to absorption is approximately 15 per cent. over clear glass, so that the performance curves for alabaster glassware can be obtained by applying the correction factor. Naturally, any data such as the above, presented on the behavior of commercial globes toward light, should be considered indicative rather than conclusive.

Comparative figures with various modern illuminants will be seen by a glance at the table (Table 1) of mean hemispherical efficiencies: data on tungsten lamps taken from published data of the N. E. L. A.; that of arc lamps from Professor Mathews' report on arc lamps; and figures on Nernst lamps from the Westinghouse laboratories.

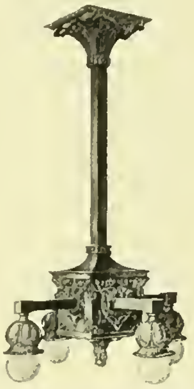


Fig. 5—Nernst Chandelier.

TABLE I.

	Eff. W. per c.p.
4-glower Westinghouse Nernst dome shade and heater case..	1.07
4-glower Westinghouse Nernst, 9-inch clear globe........	1.12
Tungstolier with clear prismatic reflectors.................	1.22
4-glower Westinghouse Nernst, 9-inch alabaster ball.....	1.28
D.C. arc shade	1.37
Tungstolier with enameled prismatic reflectors...........	1.45
Old 6-glower Nernst lamp, 8-inch alabaster ball..........	1.64
A.C. enclosed arc shade	1.75

Life of the Various Units.

Next in order of importance is the life of the unit. A summary of the life of the various elements is given in the following table (Table 2).

TABLE II.

Part.	HOURS LIFE			
	D. C.	A. C.		
		25 Cycle	60 Cycle	133 Cycle.
	220-v	220-v	220-v	220-v
Glower	600	400	800	800
Heater	3000	3000	3000	3000
Ballast	15000	15000	15000	15000
Screw Burner	600	400	800	800

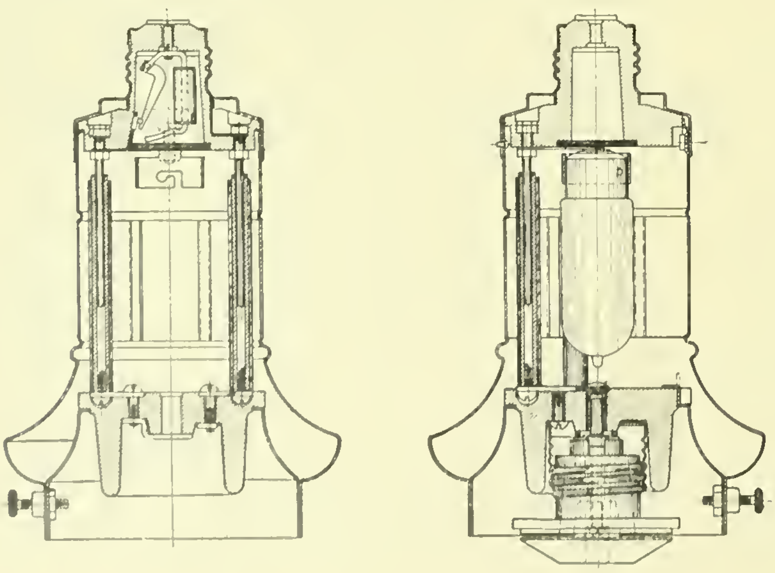


Fig. 4 Sectional Views of Single-Glower Nernst Lamp.

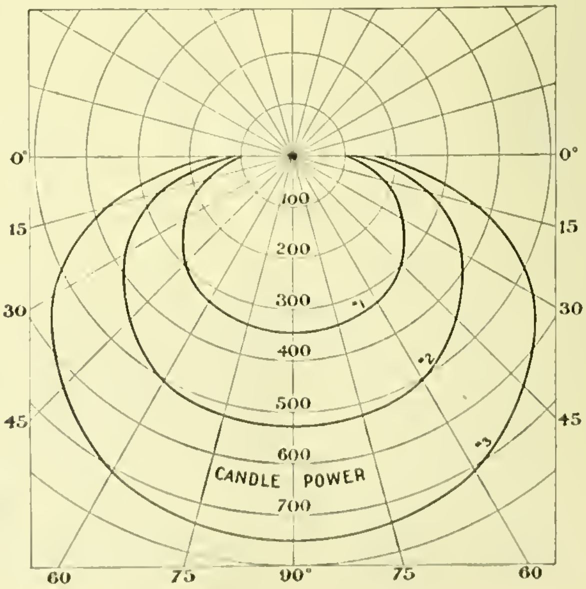


Fig. 6. Distribution of Light.

Power Development at Bonnington Falls

Nelson's New Municipal Power System Described—Chiefly an Allis-Chalmers-Bullock Installation—Cheap Power for Manufacturers

The largest individual enterprise of the corporation of Nelson, B.C., is its power and light system. At Upper Bonnington Falls, ten miles below the city, on the Kootenay river, is the power station. For five years this plant has provided the energy for the city's lavish lighting system, which includes commercial as well as street lighting.

When the city of Nelson was incorporated in 1897 the lighting business was in the hands of the Nelson Electric Light Company. In the year 1898 the city bought out the company for $40,000, its principal asset being a small generating plant on Cottonwood Creek. The plant consisted of four generators of 1,000 kilowatt capacity. In 1901 the city purchased an alternating generator. The plant was destroyed by fire later, and the city became a customer of the West Kootenay Power & Light Company. This relation was maintained until the present municipal plant was producing power.

The first step toward the present modern plant was taken in 1904, when the city purchased a site on the Upper Bonnington Falls, on the south side of the river. In the following year a debenture issue, $150,000 in amount, at five per cent. interest, maturing in twenty years, was authorized and executed, and a contract was let for the excavation. The work was pushed smartly, and in July the contract for the erection of the generator and turbine was let to the Allis-Chalmers-Bullock Company for $43,485, the great cement building having been erected by the city by day labor under A. L. McCulloch, city engineer. In 1906 another debenture issue of $50,000 was necessary in order to complete the plant. Trouble with the governor supplied delayed the taking over of the plant. The engineering company finally supplied a governor made by the Lombard-Replogle Company, of Akron, Ohio, and the plant was accepted in July, 1908. The company operated it for about two years prior to its being taken over, the city bearing the cost of operation.

On October 1st, 1908, the city authorized an $80,000, 20-year 5 per cent. bond issue for the duplication of the plant already installed and for a small addition to the power house. The object of doubling the capacity of the plant was not to develop more power, but to have an alternative generating plant, so that a guarantee of absolute service could be given. The second unit is now in working order, and the city will be in a position to sell power for industrial purposes, a handsome revenue being expected to accrue in the early future from this investment. The contract for the generator and turbines was let to the Allis-Chalmers-Bullock people for $31,095, the contract also including two governors for $3,725 each, a switchboard for $5,500 and an exciter for $1,150.

A Fine Power Plant.

Seen from almost any angle, the Upper Bonnington Falls are indescribably beautiful, but probably the most satisfactory view is obtained from the summit of the cliff on the south bank. Here stands the residence of the superintendent of the city's power plant, while at no great distance are the bunk house, the store house, the blacksmith shop, the engine and boiler room, and other buildings that appertain to the plant. At the southern extremity of the falls is located the power house, a cement and steel structure, 105 feet in height. This imposing building is like a great grey elevator, and its foundations are far beneath the water level at the foot of the falls. Its tonnage of cement is large. Three pits, 62 feet in depth, are beneath the floor of the generator room, two of the pits being occupied by the present generating plant. Outside the building, at the west end, is the lower portion of a fourth pit, which may some time be required, in which event the building will be extended in that direction. Rearing up against the falls the colossal building thrusts an arm into the stream above the brink, diverting and holding a body of water sufficient to supply the turbine with the 150,000 miners' inches to which the city is entitled.

This arm is the wing dam. The water it encloses is the fore-bay, and its office is to provide the "head," which, forcing the water at a high rate of speed through the turbine, converts the energy into a form in which it can be utilized by the city ten miles distant. It extends parallel with the shore and it is 120 feet in length and 36 feet 5 inches in height, while at the base it is 28 feet thick. At the lower end of the fore-bay is the intake, by means of which the water begins its swift journey to the turbine. At the end of the fore-bay wall are two sluiceways equipped with stop-logs, which can be lifted out in the event of very high water, or, in case it is desired, to clean out the intake. Lifting them permits the water to run through underneath directly to the tailrace.

The Power House.

This is a great concrete chamber about 40 feet in height. The main floor is perhaps 20 feet below the level of the fore-bay. In the centre is located the big generator, a large cylindrical machine, perhaps 12 feet in diameter and enclosed in an openwork casing. Off to one side is the governor, which regulates the gates of the turbine. On the other side is an exciter. At the eastern end of the great chamber are the switchboard galleries, three in number. Overhead is the gian travelling crane, which can handle a weight of 20 tons.

The pits in which the generators work comprise a succession of chambers, five in all, separated by cement floors. The various chambers are arched, so as to have the greatest strength. Through them all runs the long shaft which connects the turbine at the bottom and the generators at the top. The chamber next to the top contains the thrust-bearing, upon which the weight of the shaft comes. Other chambers contain couplings, for the great shaft is in three sections. The chamber next the bottom contains the great turbine, which in its casing looks exactly like a great black curling stone, more than the height of a man and sixteen feet in diameter at its middle line. The wheel inside, with its innumerable blades, is fifty-two inches in radius.

The turbine rooms merits some detailed description. On the south side the water enters the turbine through a pipe six feet six inches in diameter. Inside the casing, on the east and west sides, are twin gates, and the cranks that open and shut them are seen above the casing. A rod connects the two cranks and continues to the foot of the governor shaft, which occupies a niche in the eastern wall. This shaft, like that of the generator, continues up through the various floors, connecting with the governor in the generating room. Occasionally the turbine room was flooded from the wheel pit, the water backing up from the tailrace. To combat this flooding a centrifugal pump has been installed. This is operated by a 25 horsepower motor, which is controlled from a switchboard nearby.

The switchboard galleries command the attention of all visitors. On the bottom floor are placed the 12,000-volt automatic oil switches. These are operated from the second floor from the operating panels. Here also are the different meters and the apparatus for regulating the voltage. On the top floor or gallery are the disconnecting switches, and the choke-coils and electrolytic lightning arresters. They are in separate cement barriers, inaccessible to any but the most determined meddler.

One of the interesting devices in connection with the generation of the current is the tachometer, or speed recorder, the rate of revolution of the generator being recorded automatically on a chart.

Nelson Substation and Equipment.

Let us now cover, via a magic carpet, the ten miles from the power house to Nelson, entering the sub-station on Victoria street. In the transformer room, which is a large chamber, there are two floors, or rather, there is a main floor and a gallery. The switchboard, located on the gallery, is the first object of interest. The upper part of the marble slab is studded with ammeters and wattmeters, for measuring the amounts of current, incoming and outgoing. There are two receiving panels and two distributing panels, and the switches are automatic. That is to say, trouble on the line opens the switch and signals the operator. The switch cannot be closed again until the trouble is removed. On the other side of the marble slab are sets of transverse bars, known as bus bars. There are two sets, and it is possible, by means of the panels and bus bars being in duplicate, to split up the load and carry any portion of it on one panel and the rest of it on the other panel. For instance, a tramway load could be carried on either one and the lighting load and the power load on the other or any combination desired.

Among the special devices with which the switchboard is equipped is a graphic recording volt meter. Its fountain holds three months' ink, its roll of paper is three months long, and the clock which winds the roll is self-winding and goes forever. Another device is a static ground detecter. Three metal plates are arranged in a circle, and equally within the influence of all is a circular piece of metal, which moves toward one or the other of the plates when the district represented by that plate has a "ground." This enables grounded wires to be traced down very quickly.

At the western end of the gallery there is a space railed off, to enter which means danger. It contains the lightning arresters, three in number. Lightning coming in on the wires, enters sets of choke-coils and is dissipated.

On the main floor are the four transformers. These machines somewhat resemble upright stationary engines, and their office is to change the current from a high voltage to a low voltage. Below the ceiling are other choke-coils.

Summary.

We have followed the water down the river, into the fore-bay, into the intake, and through the pipe into the turbine, the governor having opened the gates. We have watched it escape into the tail-race, exerting a downward pull, and finally flowing over the weir, joining the turbulent and surging water below the falls.

We have seen the turbine revolve, and by means of a shaft over 40 feet long, start the generator on the main floor of the power house, the exciter has generated a current which has magnetized the fields of the generator, and that great machine, which somewhat resembles the head of a capstan, magnified several times, is generating a current of anywhere between 530 and 1,250 horsepower, the governor keeping the gates at the position to admit exactly the required amount of water. We will now follow the remaining operations.

The operator at the power station puts in the switches and the current of 12,000 volts is transmitted to the sub-station in Nelson, entering by cables in lead pipes, which conduct it to the transformers, where the 12,000-volt alternating current is transformed to a current of 2,300 volts. This enters the receiving panels on the switchboard, passes into the bus bars, and through them into cables in lead pipes, into the choke-coils for the city lines, and then out of the sub-station into the distributing system. Entering the transformers on the poles around the city the current again changes its character, becoming a current of 110 volts.

At this voltage the current enters on its diverse mission in home, store and factory, while at night, during the period of the "peak" load, the energy snatched from the falls makes Nelson the best lighted city in British Columbia.

Vancouver and Our Western Provinces

Unusual Business Activity — Big Extensions to Vancouver Power Company's Generating Plant — New Electric Plant for Yukon

Rapid Business Expansion.

The following relative figures, issued by the B. C. Electric Railway Company, speak for themselves, not only of this company's progress, but of the rapid expansion of business in almost every part of Western Canada:

Percentage Paid to City.

	1908.	1909.	1910.
January	$ 926.76	$1,095.28	$1,539.04
February	883.20	1,090.50	1,415,37
March	956.42	1,464.41	2,541.47
Total	$2,766.38	$3,650.19	$5,495.88
Passengers Carried.			
January	1,117,123	1,293,086	1,980,338
February	1,072,150	1,291,064	1,839,796
March	1,172,185	1,518,704	2,245,462
Total	3,361,458	4,102,854	6,065,596

B. C. Electric Railway.

The B. C. Electric Railway Company will have extensive terminal facilities at Chilliwack, some 40 miles east of New Westminster, to which point the line will be opened in the near future. The company has acquired a tract of about 40 acres, with over 1,000 feet frontage on the river, where a large yard with tracks capable of storing 300 cars will be established, together with carbarn, repair shop, etc. It is also intended to construct a large wharf with freight shed, to take care of all freight which is handled by steamer from and to the Fraser Valley branch, and a loop line to the waterfront will facilitate the handling of the large log traffic expected over the line. The unloading of logs into the river will be accomplished by an electric unloader. Manager Allan Purvis, of the Fraser Valley branch, places the cost of the above improvements at $100,000.

Construction work on the new central depot at New Westminster for the British Columbia Electric Railway will commence about May 1st. The new freight sheds will be completed by that date, and will accommodate much of the business until the new depot is erected.

Four workmen employed in erecting the 200-foot cement smokestack in connection with the British Columbia Electric Railway Company's new auxiliary plant at Vancouver, passed through an experience on the morning of April 9th that might easily have turned their hair gray. The stack, which has now reached a great height, is being built in six-foot sections, one each day, a wooden frame of that height being set on the top of the portion completed the day previous, then filled with the cement mixture, and left to harden. At 11 o'clock, just as the men began to pour the mixture, the section which had been poured the day before began to crumble, and the men were forced to grasp the staging to save themselves from dropping to the ground far below. The staging was attached to the defective section, but fortunately enough of it held in place to support the men for a time. It is unnecessary to state that work was suspended for the balance of the day.

Vancouver Power Extensions.

The Vancouver Power Company was successful in its application to the Dominion Government for authority to raise the height of its dam at Coquitlam to 85 feet, which will raise the level of the lake 65 feet. Connected with this scheme for vastly increasing the available water power is the doubling of the tunnel between Lakes Buntzen and Coquitlam, and it is expected that the whole work of improvement will occupy about two years. To facilitate the carrying out of the company's plans, the government has agreed to sell it seventy-five acres of land at the lake Coquitlam portal of the tunnel, and 3,956 acres around the lake, which will be flooded when the new dam is in position. It is supposed to install a new electrical unit of 20,000 horsepower, raising the total development to over 50,000 horsepower.

Current Notes.

Nelson city council at a recent meeting voted to abolish the city's electrical supply department and to meter all public places that are consumers of electric light.

Good progress is being made in the work of installing the Dominion government wireless station on Digby Island, from which Prince Rupert will be served by both telephone and telegraph through a 1,500-foot cable laid across the entrance to the harbor, allowing the wires to be brought directly into the city.

J. Wilson, of Vancouver, western superintendent of the C. P. R. telegraphs, is authority for the statement that a new cable has been ordered and will be laid in June between Departure Bay, Vancouver Island, to English Bay, Vancouver. In future Vancouver Island will therefore be connected with the mainland by two direct cables. The one to be laid will consist of three separate telegraph lines, and will cost about $65,000.

The Grand Trunk Pacific Railway Company proposes to erect wireless stations at various points in the mountains, and so connect Edmonton with the Prince Rupert terminal at once. In addition to the possible great commercial advantage, and the aid given in construction work, the general manager at Winnipeg would be placed in close touch with the officials in charge on the Coast.

The British Columbia Telephone Company has greatly improved its long distance service on the Coast by the installation of heavy copper wires. A new line has been strung direct to Seattle, communication has been established between Mission City and Agassiz, where an exchange has been established, and on Vancouver Island a line will shortly connect Keating and Sidney with Victoria.

Revelstoke will shortly be one of the best lighted towns in British Columbia. The new power dam is nearing completion and the municipality has purchased fifty luminous arc lamps, which are now being placed and wired by City Electrician North. The new lamp is much more brilliant than the ordinary arc, besides being more economical in consumption of current and requiring less attention than the old ones, and imparts a brilliant appearance to the streets.

A complete electric plant, consigned to the Northern Light & Power Company, Dawson, was sent north from Vancouver a few days ago on the Norwegian steamer Elsa.

Ladysmith (Vancouver Island) city council has adopted the following rates for the supply of electric light: First 40 kw. hours, 14 cents; next 60 kw. hours, 13 cents; next 100 kw. hours, 12 cents; next 200 kw. hours, 10 cents; all after 400 kw. hours, 8 cents. This is on a monthly basis, with discount of one cent per kw. hour if paid on or before the 20th of each month. This new tariff effects a general reduction in the charges.

City Electrician McCrossan has been engaged in an energetic campaign to have the streets cleared by the removal of unsightly poles to the lanes in rear of the city blocks and residential streets. In accordance with this program Mr. McCrossan has completed arrangements with the B. C. Electric Railway Company to remove their poles off a large number of streets, and if joint action is taken by owners to change existing front connections to the rear, all poles will come down. This is a forward step.

Montreal, Quebec and Eastern Canada

Quebec Underwriters' Association Establishing New Offices—Plans for Uuderground System outllned—St. John Railway Company Enlarging Plant

Business Outlook Very Encouraging.

The spring outlook for the various electrical trades in the Quebec and Eastern districts is most hopeful if one can judge from the general average of the reports received. The volume of business being transacted at the moment by the electrical manufacturers is fairly heavy and consists of numerous small orders with a moderate intersprinkling of those of a larger type. Enquiries are coming in gradually and a number of excellent prospects are reported to be on the tapis just now. In the asbestos district engineers claim that their work is being delayed by the tardy deliveries of the electrical companies. The manufacturers on their part say that the delay is caused by the scarcity of the grades of American mill steel essential for the construction of their machinery, and they are refusing to book orders on certain machines except for extended deliveries.

Canadian Fire Underwriters in Quebec.

The recent opening of an office in the city of Sherbrooke by the Canadian Fire Underwriters' Association makes the third office which has been opened in the Province of Quebec to ensure a proper inspection of electric lighting and power installations

This move for extensions on the part of the Board of Underwriters is the direct result of the growth of demand for the services they are furnishing through their electric department and which have been productive of excellent results in this province.

The new office at Sherbrooke will be operated along lines similar to those in Montreal and Quebec and will be in charge of Mr. P. Barrow and staff, under the supervision of Mr. James Bennett, chief electrical inspector for the Province of Quebec for the Canadian Fire Underwriters' Association.

That the city authorities appreciate the services of the Underwriters' electrical bureau is evidenced in the passing of a by-law by the council, on the recommendation of the Board of Control, making it illegal for the local power company to connect up either lighting or power services without a certificate first being obtained from the Underwriters' bureau.

The authorities of St John's, Que., have also adopted a similar measure.

The proprietors of the moving picture shows have waited upon the Board of Control with the request that no licenses be issued to picture shows in Montreal unless the premises have passed the inspection of the Canadian Fire Underwriters'

C. E. A. Convention.

Several Montrealers have already expressed their intention of attending the Convention of the Canadian Electrical Association this year. The alluring prospect of visiting the famous Muskoka district will attract quite a number of the electrical fraternity to the Royal Muskoka on the Convention dates, July 6th, 7th and 8th. We understand that the entertainment committee are sparing no effort to make this year's gathering an unprecedented success.

Electrical Association, Province of Quebec.

At the April meeting of the Electrical Association, Province of Quebec, held in the Association's room on Thursday, April 14, a paper on "Selling Methods in the Electrical Trade," prepared by Mr. G. R. Bliss, jr., for a recent Convention of the National Electrical Contractors' Association, was read. The paper proved quite interesting and invoked an extensive discussion. The question of protection to the electrical contractor by the jobber and manufacturer has been a burning one for some time in the United States, and the matter is of particular local interest.

Montreal Light, Heat and Power Company.

The Montreal Light, Heat & Power Company's bill against the city has now reached $190,000. The Board of Control have taken up the matter, but so far no arrangements for a settlement have been made and this matter, together with the question of granting a contract to the company, it is understood, has been referred to the City Council for their decision.

Eight quadruple No. 102 B. railway equipments were recently supplied to the Ottawa Railway Company through the Montreal sales office of the Canadian Westinghouse Company, Limited.

Montreal Underground and Elevated.

The plans of the Montreal Underground & Elevated Railway Company, who are applying at the present session of the Quebec Legislature for a charter of incorporation are quite extensive and ambitious. The company's plans in the main deal with subway construction, and the present intention is to operate a subway system from the down-town section to the furthest suburbs.

The routes would be along the length of St. Catharine street, with a parallel system on Notre Dame street, connected at frequent intervals. Another section would branch north under St. Lawrence Boulevard, while a section would feed the Point St. Charles district. Part of the Point St. Charles system would possibly be elevated.

It is understood that the men behind the new company are not interested in any of the existing traffic carrying lines in the city of Montreal.

While it is not figured that the underground system will be an actual necessity for at least fifteen years, yet the new company hope to commence construction at once and to gradually extend their operations as the traffic demands.

Mexican Northern Power Company.

Mr. G. F. Greenwood, president of the Mexican Northern Power Company, has just returned from an extended visit to Mexico. Mr. Greenwood states that the construction of their railway from Sta. Rosalia to the site of the proposed dam on the Conchos river has practically been completed by Messrs. Pearson & Son, Limited. Mr. W. J. Davis, of San Francisco, is the chief engineer of this project, which calls for the development of 40,000 electrical horse-power and the irrigation of 200,000 acres of new land.

The preliminary engineering work is now being proceeded with, and it is anticipated that the whole work will be completed by August, 1912.

Canadian Light and Power Company's Progress.

The work of development at St. Timothee for the Canadian Light & Power Company is proceeding at a rapid rate. Contractor Nicholson, who has the contract for excavations for the forebay, is making excellent progress. Further contracts have just been signed which involve an expenditure of $750,000. The Canadian General Development Company will make extensive improvements to the canal between St. Timothee and Valleyfield, while a large contract for improvements to the mouth of the canal at Valleyfield, building of sluice gates, etc., has been awarded to Messrs. Fraser, Brace & Company, of New York. Mr. Chas. E. Fraser, a member of this firm, is in Montreal at the present time and, in fact, is an old Montreal boy, having left here ten years ago. He is a graduate of McGill University and a member of both the Canadian and American Society of Civil Engineers.

Notes from McGill.

The last meeting for the year of the McGill Electrical Club was held on Monday, April 11th. Prof. Herdt was the speaker, and reviewed in his usual able style the past year's progress in electrical engineering.

It was announced at this meeting that a visit would be made by the Club during the first days of May to the points of electrical interest in the Toronto, Hamilton and Niagara districts. About twenty members of the graduating class expect to take part in this visit.

The McGill University authorities have ordered a further unit to be installed in the new power house by the end of August. It will consist of a 450 horse-power Bellis Marcom engine, direct connected to a 300 kilowatt three-wire commutating pole generator supplied by the Canadian General Electric Company. The engine is being supplied by Messrs. Limorie & Lambe.

The regular work in the engineering department has closed for the year and the students are busily preparing for examinations, which commenced on the 18th April and will last until the end of the month.

The Corporation of McGill University have just decided to honor Prof. L. A. Herdt by conferring upon him at next convocation the degree of Doctor of Science.

Current Notes.

The Kaministiquia Power Company have closed a contract for 200 horse-power with the Fort William Coal Dock Company, Limited, a new corporation just organized and now building a large coal dock on the Mission at Fort William, Ont.

The Montreal Street Railway Company have placed an order with Messrs. W. J. O'Leary & Company for the installation of two D. P. storage batteries for the operation of oil switches in one of their substations.

The Sayer Electric Company have opened a branch store at 797 St. Lawrence Boulevard. The new premises are quite handsomely fitted and a full line of fixtures for both wholesale and retail trade is being carried in stock.

The Duncan Electric Company, Limited, 86 Grey Nun street, are at present working their factory to full capacity and report an excellent spring trade thus far, with most encouraging prospects from the West.

The Montreal Street Railway Company have just added an electrically operated rail welder to their equipment and are engaged at present in operating a series of tests. The new outfit is carried upon car trucks and is readily portable

The Shawinigan Water & Power Company are just issuing from their executive offices at Montreal a handsomely designed booklet, descriptive of their property and plant in the Shawinigan Falls district. This little magazine, which is intended for the company's private circulation, is profusely illustrated with excellent engravings and the whole work reflects much credit upon this enterprising power company.

Messrs. W. J. O'Leary & Company are proceeding with the installation of elevators and electric clutches for the Harbor Commissioners of Montreal.

The St. John Railway Company, St. John, N.B., are preparing to enlarge the capacity of their plant by the addition of a 500 kw. exhaust steam turbine, and LeBlanc condenser, which will be connected to a 750 kw. motor generator set built for street railway work. A new switchboard equipment will also be added in conjunction. This new equipment is all being supplied by the Canadian Westinghouse Company, Limited, through their Montreal sales office.

Part of the Canadian Crocker-Wheeler Company's new plant at St. Catharines, Ont., was placed in operation on March 31st, and the work of equipping the various shops is being rapidly carried to completion.

The Pennsylvania Water & Power Company's plant at McCall Ferry, Pa., in which Montreal parties are heavily interested, is making rapid progress and nearing completion. Thirty-one car loads of water wheels and electrical apparatus arrived at the plant during the first 15 days of this month.

The Kaministiquia Power Company have declared a dividend of 3 per cent. on the common stock.

Personals.

Mr. E. A. Seath, formerly with Mr. Jno. Forman has joined the sales staff of the local office of the Canadian General Electric Company.

Mr. J. R. Painchaid, electrical contractor, 248 Amherst street, is removing on May first to 973 St. Denis street.

Mr. Phil. Walker is now connected with the selling department of the Northern Electric & Manufacturing Company.

Mr. J. M. Walkley has accepted a position on the sales staff of Mr. John Forman.

Mr. R. S. Kelsch has returned from an extended business trip through the Eastern States.

Mr. H. M. Hopper, for a number of years secretary-treasurer of the St. John Railway Company at St. John, N.B., has been appointed general manager for the Company.

Mr. R. Edwards, jr., formerly assistant sales manager of the Western Electric Company, Chicago, is now connected with the Northern Electric Company, with offices in Montreal.

Mr. A. H. Cleveland, formerly with the New York Edison Company, recently became associated with the power sales department of the Montreal Light, Heat & Power Company.

Mr. Cope, of Messrs. Cope & Sons, electrical supply dealers, Vancouver, B.C., was in Montreal recently.

Mr. Fred. Thomson is on an extended visit combining business and pleasure in a trip to the Canadian West with Macklem, Sask., his objective point.

Mr. Irving Smith has removed his office from 40 St. Antoine street to more commodious quarters at rooms 406-407 St. Nicholas Building. Mr. Smith is carrying a number of standard American agencies and is now in a better position to take care of enquiries.

Mr. R. S. Kelsch, Montreal, has been retained by Montreal parties to make a report on the water power properties at Marseilles, Ill.

Mr. C. J. Young, head of the electrical department of the Henry Morgan & Company, has severed his connection with that firm.

Mr. M. Rubenstein has been awarded the contract for the installation of electric lighting system in the new Royal Arthur School, and also in the Guaranteed Milk Company's new premises.

The Megger—An Instrument for measuring Insulation and Conductor Resistance—Its Construction Explained

This instrument stands in practically the same relation to electrical resistance as an ammeter does to current strength or a voltmeter to electro-motive-force.

In its plan of construction, too, the Megger is much similar to the movable coil type of both the ammeter and voltmeter. The Megger is simply a high resistance ohmmeter. The amount of the resistance is shown by direct reading of the deflection of the needle along a scale which is marked off in ohms and megohms. The necessary e. m. f. for the test is supplied by turning a crank at the side of the instrument, which operates a hand dynamo inside.

The deflecting system consists of a set of coils ABB' (see Fig.) rigidly fastened together, which move about a centre O in the magnetic field of strong permanent magnets MM. The nature of this construction brings the instrument into the class of moving coil permanent magnet instruments, the various advantages of which for reliability, accuracy under all conditions of use, promptness in taking deflection, are well known. For the control of the moving system springs are not used; so that when not in use the needle may stand at any point along the scale.

If the generator is set in motion and no resistance is connected between the external terminals, current flows only through the coils BB' which move at once to such location that B is clear of the horn on the pole piece and B' is central over the air gaps in the Ↄ shaped centrally placed hollow iron cylinder. The needle then stands over Inf. on the scale showing an infinite resistance between the terminals. If a measurable resistance is connected between the terminals, current flows through coil A and due to the thrust experienced by it in the magnetic field the needle moves along the scale and a direct reading of the amount of resistence so connected is made.

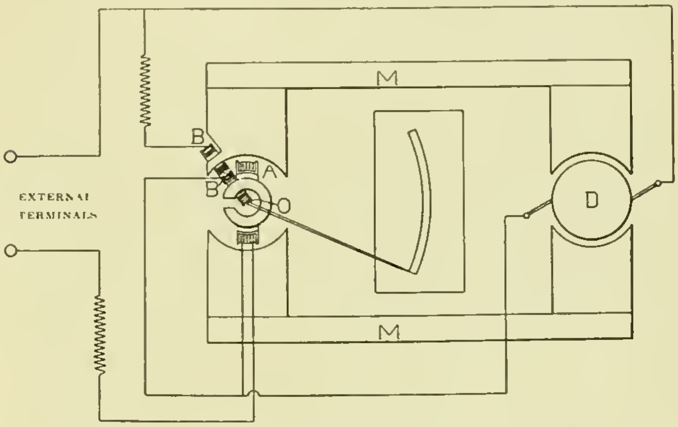


Diagram showing Internal Structure of Megger.

As in all ohmmeters, the reading is independent of the voltage of the dynamo, except that in order to have positive control and to make a real determination some minor value of e. m. f. must be exceeded. The hand dynamo D operates in the field of the same permanent magnets. With this instrument resistances up to 1,000,000 ohms may be read direct from the scale.

Trade Enquiries

The Dominion Government Trade and Commerce reports contain the following trade enquiries. Readers of the "Electrical News" may obtain the names of enquirers by writing us, enclosing stamped envelope and stating number of enquiry:

615. **Agents.**—A London firm wishes to appoint energetic and reliable agents in all the principal cities of Canada for the sale of their machinery, tools, electrical apparatus (both scientific and commercial), power generators, etc.

618. **Sheet metal stampings.**—A firm in the English Midlands manufacturing sheet metal stampings from 1-2 inch to 42 inches in diameter for the engineering trade, motor manufacturers, electrical engineers, etc., wish to do Canadian business.

543. **Porcelain insulator.**—A London firm manufacturing a new patent porcelain insulator for telegraph, telephone, light and power purposes, wish to enter the Canadian market.

515. **Agents.**—A Midlands company manufacturing dynamos and motors, lamps, fans, switch gear and other electrical apparatus, seek suitable Canadian representatives.

672. **Agent.**—A London firm manufacturing electrical generators, motors, fans, switches, arc lamps, cables, fittings, accessories, bells, telephones, etc., one of the directors of which is shortly visiting Canada, wish to enter into correspondence with some first-class Canadian firms, with a view to appointing a representative in the Dominion.

QUESTIONS AND ANSWERS

GENERAL RULES TO BE OBSERVED BY CORRESPONDENTS:

1. All enquiries will be answered in the order received, unless special circumstances warrant other action.
2. Questions to be answered in any specified issue, should be in our hands by the close of the month preceding publication.
3. Questions should be confined to subjects of general interest. Those pertaining to the relative value of different makes of apparatus, or which for intelligent treatment, should be placed in the hands of a consulting engineer, cannot be considered in this department.
4. To avoid trouble and unnecessary delay, correspondents should state their questions clearly, so that there can be no possible doubt as to the information required.
5. In all cases the names of our correspondents will be treated confidentially.

Field Circuit-dividing Switch on Rotary.

Q.—Kindly state the reason for inserting a field circuit-dividing switch on a rotary converter, and also what action it has on the operation of the converter.

A.—A rotary converter before being placed in service must be brought up to synchronous speed and into step with the supply system. The application of polyphase currents directly to the stationary armature without field excitation, will result in a rotating magnetic field about the armature core. The eddy currents thereby induced in the pole faces will exert a torque on the armature and cause it to speed up to synchronism. Under the conditions of starting, the step up transformer relation between the field and the armature winding causes a relatively large e. m. f. to be generated in each field coil. To lessen danger from this source, the windings on the separate poles are insulated from each other so that the e. m. f. generated in the coils will not be in normal series relations and thus the total e. m. f. across any two points may be limited to that generated on one pole winding alone.

Ventilation for Armatures.

Q.—Please inform me as to the different methods employed by the large electrical motor and generator manufacturers to provide ventilation for the armatures.

A.—The modern tendency, we believe, is to equip the rotating members with large outwardly extending blades and to provide numerous ducts within the rotating and stationary cores, so that motors of a given size can carry continuously larger loads than heretofore; the load on the machines being largely limited by the facilities for cooling provided. Sometimes motors and generators are placed over openings in air blast chambers used for cooling transformers or over openings which naturally cause a draft of air to pass through the machine below. Sometimes armatures are designed with large radiating surfaces, so that the heat formed is readily dissipated.

Voltage Varies Directly as Speed.

Q.—If a generator running at 225 r. p. m. generates 105 volts what must be the r. p. m. of the machine if a potential of 125 volts is required?

A.—If the machine is separately excited with a constant field, the r.p.m. must be (225 multiplied by 125) divided by 105 equals 278 (approximately). If the machine is direct current, and therefore self excited, the field strength will be somewhat increased at 125 volts and the speed will be slightly less than 278 r. p. m.

Holes in Mica Segments.

Q. The commutator of a motor has two small holes in the mica segments which have caused considerable trouble. Can you suggest a remedy?

A.—New mica sheets should be obtained as soon as possible, but temporary relief can be obtained by using a mixture of powdered mica and shellac.

Synchronizing Dynamos with Different Speeds.

Q. We have two alternators, belt-driven, which we wish to operate in synchronism with one another, but the speed of one is just a trifle too low. Can you suggest a method for bringing this machine up to the proper speed?

A.—This may be arranged satisfactorily by enlarging the diameter of the pulley to which the slower machine is belted. You can do this yourself by gluing thin canvas or strong manilla paper to this driving wheel. Be sure, however, to apply the glue very thin while quite hot.

Alternating Current from a D. C. Generator.

Q. Is it possible to obtain both alternating and direct current from a bipolar direct current generator? If so, how can this be done, and what will be the frequency of the alternating current?

A.—Yes, a bipolar direct current machine will deliver alternating current if a pair of insulated metal collector rings be connected permanently to any two commutator bars which are diametically opposite each other, and by keeping these rings in continuous connection by means of a pair of brushes separate and distinct from the direct current brushes. The frequency of the alternating current in cycles per second will be equal to the revolution of the armature per second.

Arc at Lamp Circuit Switch.

Q.—In opening an arc lamp circuit there is seldom more than a very small arc at the switch. With the large amount of current passing why should this be the case?

A.—It has been found that any arc, however small, quickly introduced in series with an arc lamp, will immediately break the circuit, the circuit being open at the arc first and not at the switch. For this reason a considerable number of arc lamps will cause no more sparking at the switch when the circuit is opened than a number of incandescent lamps. By reason of this feature considerable economy may often be effected by using snap switches, this type of switch having a longer life than the knife switch.

Varying Voltage in Street Railway Circuits.

Q.—When shunt wound motors are installed in street railway circuits, trouble is caused frequently owing to the dropping of the voltage and its just as sudden rising, which causes the motor to flash over. Could not this be partly remedied by placing a properly designed choke coil in one leg of the circuit?

A.—A choke coil with a very large reactance and small resistance should materially lessen the trouble. The introduction of commutating poles would also assist. If efficiency is not to be considered a resistance inserted in the armature and in the field circuit would effectively reduce the sparking.

Formula for Calculating Size of Cable

Q.—Please inform me what size cable is necessary to carry 650 amperes, 5,250 feet with 250 volts available at the generating end, allowing for a ten per cent. drop on the line? Is there any formula from which it can be derived?

A.—The following formula gives the size of cable in circular mils: $A = 11 \times I \times D \div V$.

Where A is the circular mils; D is the distance in feet both ways between the points in question; V = the loss in line voltage; I = the current in amperes carried by the wire and 11 is a constant, being the resistance of one mil-foot of copper wire at 75 Fahr. Substituting the values in the formula, the size of the cable in circular mils is found to be 3,003,000.

Canadian Boving Company in Permanent Office

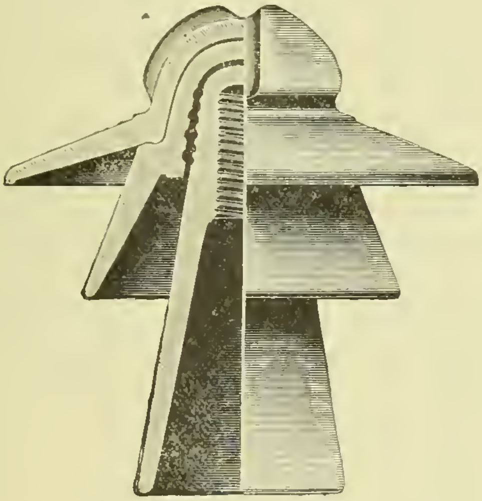
In the April issue of the ELECTRICAL NEWS mention was made of the newly formed Canadian Boving Company, a firm of water and general power engineers, having similar aims to the old established Jens Orten-Boving Company of Sweden with branches in England and Scotland.

The general manager of this company, Mr. F. A. Yerbury, announces their permanent address at 164 Bay street, Toronto, and reports, in addition to the Winnipeg and Calgary installations mentioned in our previous issues, further orders from the city of Toronto for eight turbine pumps ranging in capacity from thirteen and a half to sixteen million gallons per day; from the E. A. Walberg Company, at Cobalt, for complete governor gear for four sets of 2,750 h.p. wheels; and from the Vancouver Island Power Company for 9,000 feet of riveted and welded steel pipe line, varying in diameter from 30 to 44 inches, for the Jordan river installation.

The Canadian Boving firm is also prepared to contract for complete steam power equipments, oil engines, paper and pulp machinery, flexible couplings, tachometers, electric reduction and refining furnaces, etc.

Bohemia's Insulator Industry

The accompanying cut represents one type of high tension insulator manufactured by the Kaolin-Industrie-Gesellschaft, Karlsbad, Bohemia, manufacturers of all kinds of porcelain apparatus for electrical work. The testing station of this company, newly installed, is claimed to be the largest in Europe. Their insulators are largely in use on about sixty European transmission lines carrying voltages all the way from 20,000 up to 80,000 and representing an installation of over half a million insulator units.



The Kaolin High-Tension Insulator.

The Canadian Knowles Company, Limited open Toronto Office

The Canadian Knowles Company, Limited, make an important announcement to the electrical trade of Canada on page 5 of this issue. This company, which has opened offices in the Bank of Toronto Building, 205 Yonge street, Toronto, will act as exclusive sales representatives for C. S. Knowles, Boston, Mass., and affiliated manufacturing interests as well as other electrical manufacturers, of which mention will be made later.

Mr. J. H. Parker, president of this company, is one of the largest and best known electrical manufacturers and operators in the United States. He is the active head of a number of prominent manufacturing concerns affiliated with his company. In order to bring about a better condition in the manufacture and sale of electrical porcelain, Mr. Parker has entered into an exclusive arrangement with leading porcelain manufacturers to handle their outputs and market the same on his own responsibility. While the large electrical jobbers at first looked with disfavor on the movement, the Canadian Knowles Company, Limited, state that at the recent convention at Richmond, Va., it was acknowledged that the movement would work out to the ultimate benefit of manufacturers and jobbers, and would leave them a good margin of profit without unduly advancing the price of porcelain goods.

Mr. G. H. Morgenstern, of Toronto, the vice-president and general manager of the Company, has been interested for the past three years in the Canadian territory on behalf of leading electrical manufacturers, and was instrumental in promoting the Canadian Knowles Company, Limited, as he felt that an organization so extensive as this should fill a long-felt-want.

Mr. E. L. Stanton, of Toronto, secretary-treasurer of the company, has been identified with the Dominion Bank for a number of years and was a member of the head office staff before taking his present position.

Mr. George O. Anderson, of the Anderson Porcelain Company, East Liverpool, Ohio, is one of the directors. He is a foremost porcelain manufacturer and business man. Another director, Mr. W. J. Cluff, of Toronto, is president of the Canada Pipe & Steel Company, and is interested in addition to the above in a number of other Canadian manufacturing interests.

Mr. F. C. Carmen, of Toronto, will represent the company in Ontario, while the Toronto business will be looked after by Mr. R. Frank Mosely, a former electrical dealer of Parry Sound. Outside of this territory the efforts are to be largely conducted through preferred outlets already provided for.

The company will shortly launch out a new flexible conduit approved by the underwriters. It has a fish wire spirally wound on the inside surface, which is aimed to do away with the waste of time by the electrician in drawing wires through the tube.

This company has olsa a new type of push button surface switch which they say is designed to take the place of the old fashioned round base snap switch with the torsion twist movement for making and breaking contacts.

A New Tungsten Factory

As stated in a previous issue, the Bergmann Electrical Works, of Berlin, Germany, have established a branch office in Montreal and are feeling their way towards the establishing of a branch factory at some favorable point in Canada where they will make a specialty of tungsten lamp manufacture. To this end it is understood that Dr. C. Rossner, the Canadian representative, is in communication with a number of cities and towns in different parts of the Dominion where power and gas may be obtained at attractive prices.

Faith in the ultimate success of the tungsten lamp industry is evidently very strong., for we already have one splendidly equipped plant in Canada for the exclusive manufacture of tungstens and there is rumor of the establishment in the near future of a third.

Obituary

R. B. Thompson, electrical engineer, New York, son of the late William Thompson, hardware merchant, Front street, Toronto, is dead. The deceased is survived by his mother, Mrs. William Thomson, Rathnally avenue; by two sisters, Mrs. F. B. Polson and Mrs. W. J. McWhinney, and by four brothers, Dr. W. P. Thomson, Albert M. Thomson and B. A. Thomson, of Toronto, and Wm. C. Thomson, wholesale lumber merchant, New York.

We regret to note the death of Mr. Harvey E. Reesor, of Lindsay. The late Mr. Reesor was a son of Mr. B. F. Reesor, former president of the Canadian Electrical Association.

A Rubber Covered Steel Mouthpiece

The ordinary composition or hard rubber mouthpiece is easily broken and is sometimes a source of considerable expense to a company in the course of a year. The ordinary steel mouthpiece removes this objection but is dangerous, being a conductor of electricity, and is a source of danger during storms or through crossed wires. The common metal mouthpiece is affected by dampness and corrodes easily.

The Kellogg Switchboard & Supply Company claim to have combined the advantages and eliminated the objections of the two styles, in the design of a new reinforced rubber covered steel mouthpiece. This mouthpiece has a perforated steel shell covered with a coating of hard rubber moulded over it at great pressure and heat. As the rubber is forced through the perforations and around the shell, it makes an absolutely unbreakable mouthpiece. The threaded portion is made directly on the steel at the base, eliminating danger of breakage at a point where rubber and composition mouthpieces often give way.

400,000 H.P. Plant for Chicago

The Commonwealth Edison Company, of Chicago, announce that arrangements have been completed for the installation of two mammoth electric generating plants to use steam turbines as prime movers. These plants when complete will each include six units of 20,000 kw. each. The present installation of this company includes three 14,000 kw. turbo-generators, to which three more of the same size are being added. According to present plans the ultimate capacity of this company's system will be well over 400,000 horse-power. It is understood that work on the power houses will be begun in the very near future and that the investment expenditure will reach in the neighborhood of $20,000,000. A site for these plants covering 109 acres has recently been purchased for $331,000.

Personals

City Engineer Bell has been appointed general manager of the St. Thomas Street Railway System.

T. S. Scott, principal asistant City Engineer of Toronto, recently resigned that position to enter, it is said, the contracting field in British Columbia.

George Poulton, of Upper Bonnington, has been selected as general manager of the Nelson Street Railway Company. Mr. Poulton was formerly manager of a tramway system in England.

H. M. Hopper, until recently secretary-treasurer, has been appointed general manager of the St. John Street Railway Company, St. John, N.B., succeeding to F. Earle, resigned. Alfred Seeley assumes the duties of treasurer.

R. Driscoll has been appointed electrical inspector for Hamilton and has his office in the Federal Life Building there. Mr. Driscoll was formerly with the Federal Engineering S Supplies Company, which he left some time ago to join Mr. Strickland's Toronto staff.

William Bate has been appointed to fill the vacancy created through the resignation of Mr. J. G. Monahan, in the electrical department of the Canadian Fire Underwriters' Association, Toronto. Mr. Bate was, until his recent promotion, with the Bennett & Wright Company.

H. Crerar, one of the electrical engineers of the Canadian Tungsten Lamp Company, Hamilton, who is in Europe visiting some of the largest tungsten lamp factories on the other side, has left London for Vienna. The Canadian Tungsten Lamp Company's object in sending him abroad was to keep thoroughly up-to-date in all improvements in high efficiency lamps, the home of the industry, in this company's opinion, being as yet on the European continent.

W. J. Wilson, late of the staff of Toronto's city engineering department, has been appointed City Engineer of Moose Jaw.

Edward J. Haughton has been appointed district superintendent of the British Columbia wireless stations of the Dominion Government Radio-Telegraph service. Mr. Haughton left the service of the C. P. R. Telegraph Company a few years ago to take the post of operator at the Gonzales Hill station in Victoria, and has been gradually advanced until he has now been given the post of district superintendent.

New Turbines for Clyde River Pulp Co.

The Clyde River Pulp & Paper Company, of Clyde River, Nova Scotia, are installing a quantity of new machinery in their works. The turbines are already in position and consist of a pair of 36 inch cylinder gate, 425 horse-power each, units; a single 39 inch, 520 horse-power unit; a single 21 inch, 250 horse-power unit, and a single 15 inch, 80 horse-power unit. The turbines are of the S. Morgan Smith type and will operate under a 28 foot head.

Efficiency of Light Sources

According to generally accepted physical doctrines, light is a form of energy; heat is a form of energy. Physicists also assert that any form of energy can be transformed into any other form of energy and that there is an accurately determinable and constant equivalent connecting the two. For instance, the English philosopher Joule determined the so-called "mechanical equivalent of heat," which is expressed by saying that so many foot-pounds of mechanical energy are equivalent to a unit of heat. Thus it would appear that one unit of heat is equivalent to so many units of light, whatever may be chosen to express this latter unit.

This problem of light efficiency is not at all a simple matter. Light as emitted by a radiant source consists of many varieties, not all of which are "visible" to the eye. Assuming the correctness of the ether theory and that light is a complex vibration of this all-pervading ether, there are some of the component parts of the vibration that are of too great a frequency, and others of too small a frequency, to produce in the mechanism of the human eye the sensation which is called light. The parts of the vibration, or, say, the component vibrations, which come within the range of the human optical apparatus, are distinguished by the colors of the spectrum, and it is only a comparatively small middle portion of the total spectrum that is available as a luminating agency.

The ideal light, to which the eye has through the ages become accustomed, is diffused daylight, and it is to this standard that light and color tests are naturally referred. Artificial illuminants do not give the same kind of light. Thus, for instance, the carbon filament glow lamp gives a yellowish light, the mercury vapor lamp a greenish yellow light, and the tungsten lamp a so-called white light, and it is a matter of common experience that colors as they appear in daylight, when viewed in these different lights, do not appear the same. Various artificial standards, therefore, have been devised, so that a common basis for comparison can be laid down. For the purpose of this review, the efficiencies will be measured by the watts per candle power, without going into a discussion of what this expression really means or of its value as compared with other proposed units.

What is the ideal efficiency of light production? In other words, how many watts per candle power will be necessary and sufficient to produce a perfectly efficient illumination within the range of the visible spectrum?

An answer to the latter question is given in an article by Messrs. H. E. Ives and W. W. Coblentz, entitled "Luminous Efficiency of the Firefly," which appeared in the February, 1910, issue of the Bulletin of the Bureau of Standards. These investigators have spectrophometrically examined the illumination of the firefly "Photinus Pyralis," the spectrum of which was photographed on plates sensitive to the whole visible spectrum.—Electrical Review and Western Electrician.

Current News and Notes

Aylmer, Ont.

The residents favor the establishment of a municipal lighting plant, electricity to be generated by a steam plant, perhaps in conjunction with the waterworks plant. J. Bradley, town clerk.

Amherst, N.S.

At the annual meeting of the Canada Electric Light Company it was decided to accept the offer of the Maritime Coal, Railway & Power Company to buy out the plant and franchise of the former. The price is about $90,000.

Brandon, Man.

The Brandon Electric Light Company has applied to the city council for power to instal in the city of Brandon a system to supply heat for public use.

City Engineer Speakman has prepared plans for the establishment of a steam generating plant, capable of furnishing sufficient power to operate a street railway, the pumping station and street lighting, and save about 300 horse power in reserve. A public steam heating system would also be served. Estimated cost $125,000.

It is calculated that this city has a power site of its own close to the city limits, on the Assiniboine river, where under an 8 or 9 foot head 1,000 h.p. could be developed at a cost of about $125,000. Proper allowances for interest, operation and depreciation would not, it is claimed, bring the price of power above $16.25 per h.p.

This city has the choice of three propositions to supply light and power from as many companies, either operating or preparing to operate in the vicinity of Brandon. These are the Brandon Electric Light & Power Company, who propose also to install a heating system: the Great Falls Power Company, owning a large water fall on the Winnipeg river, who offer power at $25; and the Western Power & Light Company, which proposes to develop on the Assiniboine river, offering terms as published in our last issue.

Berlin, Ont.

Property owners carried two bylaws one to take $60,000 worth of stock in the People's Railway Company, and the other to grant certain franchises to the company along the public streets.

Brockville, Ont.

It has been decided to submit a bylaw to the ratepayers on April 25th, providing for an expenditure of $50,000 to amalgamate light and water plants.

Coaticook, Que.

The bylaw to borrow $122,000 for the purpose of improving the light plant, and for other purposes, was carried.

Cranbrook, B.C.

In a letter to the Cranbrook Board of Trade, the Dominion Minister of Mines stated that it was proposed to inquire into all the known methods of electrical smelting of zinc. Not only would investigations be conducted in this country, but they would probably be extended to Europe, and the process which was best adapted to conditions here would be adopted.

Calgary, Alta.

The commissioners have recommended that a bylaw to raise $125,000 for the proposed municipal electric power plant, be submitted to the ratepayers. City Engineer Childs has completed plans.

An estimate of the amount that will be required for electric light extensions has just been prepared by Commissioner Graves, and includes: 86,074 pounds weatherproof wire at 18 and 20 cents, $15,593.32; 550 poles, various sizes, $2,169; 2,600 cross arms, various sizes, $920; machine and carriage bolts, washers, wood screws, nails, guy wire and clamps, cross arm braces, fuse wire and plugs, rubber-covered wire, porcelain tubes, top pins, D. P. insulator, lamp sockets, pole steps, sundries, $5,621.27; meters, various sizes, $12,000; transformers, various sizes, $10,280; 100 arc lamps and station transformers and equipment, $7,000. Total $70,000.

Edmonton, Alta.

The power house, built only last year, is reported to be in such bad shape that it will have to be torn down and rebuilt. The machinery also is described by an expert as "a monument to the enterprise of manufacturers' agents."

The citizens voted on April 21st on a bylaw to issue $30,000 debentures for the purpose of extending and improving the municipal electric system; also on the same date on a bylaw to issue $60,000 debentures for the purpose of erecting, etc., car barns for the municipal street railway system; also on the same date a bylaw to issue $260,500 debentures to extend and further equip the municipal street railway system.

Fernie, B.C.

A $6,000 by-law for electric light extensions will probably be submitted.

Fort Frances, Ont.

The special committee appointed to deal with the telephone question recommended that plans be prepared and tenders called by the town for the installation of a modern plant.

A further extension of time for exportation of 200 h.p. had been given the Minnesota & Ontario Power Company, said right to export the electric current being revokable.

The by-law to raise $10,000 for the installation of a municipal street lighting system was carried. The proposed expenditures are as follows: Poles and crossarms, $1,300; wire, $2,900; transformers, $900; arc lamps, $1,100; lamps and miscellaneous supplies, $550; pole construction, $900; line construction, $850; meters and inspection, $950; Engineering and contingencies, $550; total, $10,000.

Fernie, B.C.

The city electrician has been canvassing the various power users and reports sufficient day load to justify a 24 hour service, which will be inaugurated at once.

Galt, Ont.

The Galt Gas Light Company, owners and operators of the electric lighting system of this town, have accepted the town council's offer of $16,500 for their poles and wires. These will be used by the town as a distributing system for the Niagara power.

Haileybury, Ont.

The New Liskeard Light, Heat & Power Company has issued a writ for $40,000 damages against the High Falls Mining Company, Limited. The plaintiffs claim exclusive right to supply electricity to Haileybury and claim these damages because the High Falls Mining Company has been awarded certain contracts for supplying electric power in the municipality. The case is fixed for the High Court.

Hamilton, Ont.

The net profits of the Canadian Westinghouse Company for the year ending December 31, 1909, were $198,379. The sales for the year 1909 were the largest in the history of the company and about double those of 1908.

Ingersoll, Ont.

The arbitrators acting for the corporation and the Electric Power & Light Company have put their valuation at $37,225. A by-law to provide for the acquiring of the plant will be submitted at an early date.

Kamloops, B.C.

This municipality agrees to take power from the Shuswap Power Company in accordance with Engineer Dutcher's recommendation. When the matter is finally settled, the company will spend, it is estimated, about a million dollars.

Kingston, Ont.

It is proposed by the towns of Eastern Ontario, from Trenton to Kingston, to discuss the power problem as to the feasibility of combining on either the Trenton Electric Company or Hydro-Electric Commission.

Prof. L. W. Gill, Queen's University, has been elected a member of the newly-formed Canadian branch of the International Electro-Technical Commission. This commission, which has local committees in all countries, has for its purpose the standardization of nomenclature and rating of electrical apparatus and machinery. Delegates meet once a year in London, Eng. The present committee is the first move that has been made in Canada in this direction. Prof. Gill has seven associates on the committee.

London, Ont.

The Water Commissioners have closed a deal for the purchase of a lot at the corner of Kitchener avenue and Cabell street for the erection of the East London Niagara power substation.

The site for the Niagara power substation has been bought on corner of Kitchener avenue and Cabell street. Plans are being prepared by City Architect Nutter and work will be commenced at once.

City Engineer Roberts is authority for the statement that the tranforming staton will not be ready for use before September 1.

At the third annual meeting of the Farmers' Telephone Company, held here recently, it was stated to be the intention of the company to extend its lines to Waterville, Centreville, Florenceville, Northampton, Southampton, Knoxford and Jacksonville.

The London Electric Light Company are said to be reducing domestic lighting rates from 9 cents to 5 cents per kilowatt hour. The city claims to be able to lower even this rate on the arrival of Niagara power.

The petition among the business men for the placing of the distributing wires underground is meeting with good success. The plan is that each business man shall bear the extra cost of installation along his own frontage. This is figured to cost 28 cents per annum per running foot which, it is claimed, is more than compensated for by the reduced rates on insurance that will follow. The companies at present add 30 cents per $1,000 insurance carried because of the presence of overhead wires.

Moose Jaw, Sask.

The city council decided, subject to the conditions being acceptable to the proposers, to make the draft franchise for a street railway received from Ottawa form the basis of a bylaw to be submitted as soon as possible. At present it provides that three miles of railway are to be constructed this year, a similar amount next year, the city to control the line of route and time schedule.

Moncton, N.B.

The Shediac Light & Power Company's nearly completed dam was in part destroyed by the spring freshet, about 25 feet of the dam being carried off. This generating plant is situated on the Scoudone river.

The terms of the agreement by which the city of Moncton agrees to lease its lighting and gas systems to the street railway company for forty years include the following. The company agrees to pay the city 3 per cent. of gross earnings for first five years; 4 per cent. for the second five years; 5 per cent. for third five year period, and 6 per cent. afterwords. The price of electric energy to the consumer shall be 11 cents per kilowatt hour, with 5 per cent. discount; of 1,200 candle power street arc, $65 a year; of 50 candle power incandescents for street lighting, $17 a year; and of natural gas, 50 cents per thousand and 40 cents for manufacturing purposes. The company is already calling for tenders for 45 miles of piping to conduct the natural gas into the city.

Montreal, Que.

The Montreal sales offices of the Allis-Chalmers-Bullock, Limited, have been removed from Commercial Union Building to Canadian Express Company's Building, 95 McGill street, immediately opposite the general offices of the Grand Trunk Railway System.

The Montreal Light, Heat & Power Company have notified the Board of Control that they will lay underground conduits for the purpose of burying their wires on certain streets in the east end of the city.

McCuaig Bros. & Company have purchased the Sherbrooke Street Railway; also water powers in the vicinity. It is the intention to extend the road considerably. A large amount of money will also be expended in developing the power plants. Ross & Holgate, consulting engineers.

For the second time within two years the Montreal Street Railway Company today announced a voluntary increase in the scale of wages paid to its motormen and conductors. The increase affects 3,000 employees, and will mean an additional expenditure of over $100,000 a year in wages by the company. The motormen and conductors receive the same pay, but are divided into three classes. Those of one and two years' standing will now receive nineteen cents an hour instead of eighteen. Those of from two to five years' standing will receive twenty instead of nineteen, and those of more than five years' standing will receive twenty one instead of twenty cents an hour.

North Gower, Ont.

A new telephone system to cover North Gower and Marlborough will be established with central office at North Gower. Capital, $30,000. President, H. G. Blair, and J. A. Craig, secretary-treasurer.

Nelson, B.C.

The British Columbia Copper Reduction Works at Phoenix will be extended to a daily capacity of 3,000 tons of ore. The production of copper for the two first months of 1910 is 1,339,707 pounds, a slight increase over the same period last year.

The Rossland Engineering Works has been taken over by the Nelson Iron Works and will shortly be removed to Nelson. Mr. W. M. Sunliffe, manager of the Rossland works, is retained by the new management.

New Westminster, B.C.

Extensive improvements are contemplated to the plant of the Mission Telepnone Company.

Niagara Falls, Ont.

In an address before the Niagara Falls Board of Trade the Hon. Adam Beck stated that the Commission could supply the town with power at $12.40. The contract at present is held by the Ontario Power Company at $10 plus exemptions, which brings the real cost to considerably more than Mr. Beck's estimate.

New Hamburg, Ont.

The town is considering the advisability of taking over the electric light plant to be used as a distributing and auxiliary system when the Niagara power arrives. It is believed an amicable arrangement can be made with the present owner, Mr. Morley.

New Liskeard, Ont.

The Nipissing Central Railway Company has submitted the draft of a franchise to the town council of New Liskeard. The franchise asks power to build and operate an electric road on the streets of the town and will connect with Haileybury.

Owen Sound, Ont.

The Hydro-Electric Power Commission estimates that the amount of power obtainable at Eurgenia Falls, near Owen Sound, would not exceed 1,200 h.p. during the dry season. Hayward Falls would add only 200 h.p., or at great additional expense possibly 400 h.p. under a 60 foot head.

Owen Sound is experimenting with a rather novel system of incandescent street lighting. It is proposed to erect arches across the streets carrying lamps every two feet, arches to be 100 feet apart. The experiment is claimed to be a great success as a lighting proposition.

Ottawa, Ont.

The Hamilton, Waterloo & Guelph Railway Company's bill and the Toronto Eastern Railway Company's bill were passed with amendments placing their operations under the control of the Railway and Municipal Board and the city of Toronto.

The Municipal Electric Commission has awarded the following contracts for supplies: Transformers, Canadian General Electric Company, $795.00; meters, Ferranti, Limited, $632.00; lathe, General Supply Company, $198.60; hardware, Thos. Birkett & Son Company, 144.93; arc lamp carbons, Engineering Equipment & Supply Company, $741.71; Insulators, Canadian General Electric Company, $66.00; arc lamp globes, Garrioch, Godard & Company, $139.12; locust toppins, Canadian General Electric Company, $37.00; tape, Canadian General Electric Company, $88.00; large split knobs, Canadian General Electric Company, 9.00; porcelain insulator knobs, Canadian General Electric Company, $15.50; portable meters, Dawson & Company, Limited, $124.90; motor, Garrioch, Godard & Company, $141.00; switch board panels and regulators, Canadian General Electric Company, 1,000.00.

Garrioch, Godard & Company have been awarded the contract for Sunbeam lamps at $1,140. The Sunbeam Incandescent Lamp Company also tendered at the same price. For wire the lowest tenderers were Garrioch, Godard & Company, and the Canadian General Electric Company, each for $1,584.00. The contract has been divided between Garrioch, Godard & Company and the Canadian General Electric Company, one-half to each.

The city council will probable pass a wiring by-law submitted by the Board of Control, which contains the following features: All electrical workers must be licensed and be over 18 years of age; an electrical inspector is to be appointed; no installations or alterations in wiring can be made without permit from the inspector; the clauses of the National Code will govern the materials to be used; no wires shall be less than 5 inches from any metallic pipes.

The city is in communication with Engineer Hazen of New York, on the question of the ozone system of water purification. It is suggested that Mr. Hazen come to Ottawa and look the field over.

The Ottawa Electric Railway Company has installed in all the cars on its lines a new eight day clock.

The House of Commons has passed a bill placing all cable companies operating between Great Britain and Canada and all other cable companies touching Canadian territory under the control of the Railway Commission.

The Federal Government has decided not to disallow the Hydro-Electric power legislation passed by the Ontario Government last year.

Prince Rupert, B.C.

Tenders are being called by electric light committee for boilers, engines, condensers, pumps and piping, together with electrical apparatus, until May 3rd. Plans, etc., obtained from Thomas Dunn, chairman of committee, this city, or from James Milne, consulting engineer, Loo Building,

Peterboro, Ont.

The same plan of lighting some of the streets as is being adopted in Owen Sound and Guelph, by stringing incandescents across the streets at suitable distances apart, is being discussed by the Peterboro Light Committee.

Portage la Prairie, Man.

Chas. Chamberlain, in behalf of the Great Falls Power Development Company, has made a proposition to the financial committee of the city council to supply power to the city at the rate of $23 per horse-power, provided the city takes 3,000 horse-power.

This town has been selected by the Saskatchewan Government as the distributing point for its telephone pole supplies.

Port Arthur, Ont.

The equipment for a wireless telegraph station arrived three weeks ago. A temporary installation will be erected on the tug Whalen, and the operators will be stationed upon her day and night until such time as the Government tower is erected and licensed.

Quebec, Que.

Plans of the Quebec Railway, Light, Heat & Power Company, as stated by the president, R. Forget, will include double tracks in the city and out as far as Ste. Anne de Beaupre, and also $15,000 on the Kent House as a place of amusement.

Regina, Sask.

Three new rural telephone companies were organized in Saskatchewan during the first two weeks in March. They are

Siemens Brothers Dynamo Works
Limited
London, England

Head Office for Canada
Canadian Birkbeck Building, TORONTO
10 Adelaide St. East

REPRESENTING THE
SIEMENS
COMPANIES

Siemens Bros. Dynamo Works, Ltd.	London and Stafford
Siemens Bros. & Co., Ltd.	London and Woolwich
Siemens Schuckertwerke G. m. b. H.	Berlin and Nurnberg
Siemens & Halske A. G.	Berlin and Nonnendamm
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High Tension Transmission Plant, Generators, Transformers, Motors, Switchgear, Instruments, Meters, Arc Lamps, Incandescent Lamps.

Electric Railroad Plant and Equipments
Electric Driving for Mining Machinery
Hoists, Pumps, Compressors, Blowers, Etc.

Electrical Equipment of Steel Works and Rolling Mills

Complete Telegraph and Telephone Installations. Fire Alarm Systems.
Electric Cables and Wires.

the following: The Elgin Rural Telephone Company, the Moose Jaw, Granton and Blue Hill Telephone Company, and the Coules Rural Telephone Company.

Renfrew, Ont.

In order to raise money for the development of the water powers, a bylaw will be submitted to the ratepayers for $77,000.

Sherbrooke, Que.

The Sherbrooke Railway & Power Company are asking the city to support them in the application for rights on the river Magog bed.

The bylaw granting a 28-year's franchise to Sherbrooke Railway Company was carried. The company promise to spend $50,000 in extensions and developments to power plant. C. B. Hibbard, Montreal, representative of company.

Stratford, Ont.

The Bell Telephone Company proposes to erect a new office building at a cost of $50,000, conditional on the granting of a 5 year exclusive franchise.

The by-law voting $85,000 for the establishment of a distributing system for Niagara Power carried by a small majority. Part of the existing private company's electric plant will be purchased or possibly all, if it can be utilized in the city's scheme of distribution.

Skagway.

Arrangements have been completed for the erection of an electric light and power station at Coal Creek, Yukon Teritory, in the Forty Mile district, which will be used for supplying light and power to the various mines and dredges. Equipment, consisting of three steam turbine engines, made by Williams & Robinson, 6 marine type boilers, steel frame work and wire for the transmission lines, has gone forward by steamer. The Northern Light & Power Company, of Skagway, is installing this plant.

St. Thomas, Ont.

City Engineer Bell advises the ratepayers to vote on the improvement to city railway on the date they vote on park improvements.

City Engineer Bell has also been appointed general manager of the street railway system, with Mr. L. D. Gillett as superintendent. This proposition has not been on a paying basis for some years, and the roadbed and rolling stock are out of repair. It is hoped to remedy these defects in the near future.

Contract for installing a booster and additional cells in the present storage battery, as well as overhauling the battery for the Niagara power system, has been awarded to the Lancashire Dynamo & Motor Co., of Manchester, Eng., and Toronto, Canada, at $3,499. The next lowest tenderer was the Canadian Westinghouse Company at $3,780. Contracts for cross arms and pins were awarded to F. Bissell & Company, Toledo, and for braces to the Canadian General Electric Company. The tenders for poles were not complete and the chairman and engineer were given power to accept the lowest or best tender.

Toronto, Ont.

The Hydro-Electric Power Commission will erect their own pumping station for the supply of water to their transformers. The pumps will have a capacity of 80,000 gallons a day.

Vancouver, B.C.

City Electrician McCrossan will show to the council the need of a new and separate building for his department.

The construction of the new wing of the British Columbia Telephone Company's building in Seymour street, will be begun at once by Messrs. Smith & Sherbourne, from designs prepared by Mr. Cox.

The electrical inspection department is insisting upon a strict enforcement of the wiring by-law, which requires that a permit shall be taken out for any new electrical work, whatever the nature, and also makes it illegal for anyone to cover any wire without notice of approval having been posted up by the inspector.

City Electrician McCrossan states that he intends to press upon the council the need of presenting a money by-law, when such measures are next submitted to the people, for the purpose of erecting the building for his department, the need of which was stated to the fire and police committee.

The B. C. Electric Railway Company is actively engaged in securing the right of way for its transmission wire from Jordan river to Victoria. This line will follow the Sooke road for the most part but in order to avoid sharp curves, which would entail extra expense in keeping in order, the company is buying a right of way through private property at such points. The right of way will be cleared of all stumps, etc. on each side of the line, and will be slashed for 150 feet further so as to avoid all risk from falling trees, fires, etc.

Victoria, B.C.

The Barkley Sound Power Company, Limited, capitalized at $10,000, and in which Mr. Alexander is understood to be interested, is applying for 2,800 cubic feet per second, to be taken from the Sarita river, there being a difference of 200 feet in elevation between the intake and the return of the water to the river, which head promises 100,000 horse-power.

Another large power company, the incorporation of which has been just recently announced, and which will confine its operations to the Kootenay district, is the International Electric Company, Limited, of the city of Nelson, which is capitalized at $100,000 in $1 shares, of which $400,000 is fully paid up. This company proposes to take 4,000 cubic feet per second from the Pend d'Oreille river, at a point half a mile from its junction with the Salmon river, and to engage in a general power business on a large scale.

During the past few weeks several important water powers on the southwest and west coasts of Vancouver Island have been staked and applied for by companies apparently related, the principal of these being the West Coast Power Company, of 511 Fort street, of which Mr. Alonza Alexander is managing director, and which has now before the Chief Water Commissioner applications for water powers on Gordon and Nitinat rivers capable of developing over 100,000 horse-power.

It is reported to be the intention of the residents and business companies interested in the Queen Charlotte Islands to proceed almost immediately with the establishment of local telephone services in all parts of the islands.

Welland, Ont.

The Niagara Falls, Dunnville & Welland Electric Railway Company has given notice that application will be made to the council in the near future for by-law granting a franchise through the town of Welland.

Winnipeg, Man.

Tenders addressed to the Chairman of the Board of Control will be received until April 30th for supply of arc lamps and regulating apparatus, switchboards and accessories insulated line wire and mast arm parts. Specifications, etc., at office of city electrician. M. Peterson, secretary, Board of Control.

The Board of Control has been instructed to call for tenders for 100 6.6 ampere luminous arc lamps, also regulators and switchboards, at a cost of $17,000.

It is stated that Dr. DeForest has selected a site for his long distance wireless telephone station. J. H. Smith, Canadian manager, Enderton Building.

The Northwestern Battery Company, Limited, has been organized to manufacture and market the Darby primary cell.

Yorkton, Man.

The town of Yorkton has engaged W. E. Skinner, Limited, of Winnipeg, to prepare plans and specifications for a lighting plant for the town. When the plans are completed the proposition will be submitted to the ratepayers for their approval.

A. C. Generator Wanted

Wanted to purchase a first-class second-hand A. C. Generator of the following description:

75 or 100 K W., 2080 Volts Primary, 60 Cycle, either single or three phase, belted, including Exciter, same to be belted to machine, also Switchboard with Ammeter, Voltmeter, Series and Shunt Transformers, Ground Detector, Rheostat and Main Line Switch. Kindly state make of machine and instruments. Box 941, ELECTRICAL NEWS, Toronto, Canada. 4

For Sale

One, 25 K. W. 125 volt Westinghouse D. C. Generator, 1 switch board complete, nineteen A and B six six arc lamps alternating current, seventeen mast arms, fourteen automatic cut outs, 1 arc regulator, 1 Switchboard switches complete. all in good condition, offers received for lot or items, delivery in thirty days. Address Secretary Treasurer Town of High River Alberta.

E. H. MACK.

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THOS. C. IRVING,
Gen. Man. Western Canada, Toronto

Canadian Agents Wanted

Responsible jobbing firm wanted to take the agency for electric heating utensils for household use. Address, EXCEL ELECTRIC HEATING CO., 52 Lawrence Street, Newark, N. J. 6

Leading firm of British telephone manufacturers are open to appoint sole purchasing agent for Montreal and Toronto. Only first-class, well established firms capable of buying large quantities of telephone apparatus, electric bells, etc., need apply. "Telephone" care of GORDEN & GOTCH, St. Bride Street, London Eng. 8

For Sale

1 C. G. E. 500 volt direct current motor 55 horse power, complete with rheostate, only been in use 9 months, good as new, A. H. CUMMINGS & SON LTD., Coaticook, Que. 5

Wanted

Alternating Current Generator, Second Hand, 3 phase, 2000 volt, 7200 alternations, 75 to 125 K. W., belt driven. Give full particulars as to condition, size of pulleys etc.

L. HARSTONE,
Secretary Board of W. L. and H. Commissioners
St. Mary's, Ontario
6

For Sale

1—Corliss Engine, 13" x 30", made by the Laurie Engine Co. in first class condition, can now be seen running.

1—Compound Duplex Pump, 10" x 18" x 12", 600 gallons per min. 50 rev. built by the Kerr Engine Co., now in use.

1—Generator Switch Board, marble panel, complete with oil switches and long scale instruments, 2200 volts, 60 cycles, Westinghouse make.

The above will be displaced by Niagara Power.

L. HARSTONE,
Secretary Board of W. L. and H. Commissioners
St. Mary's, Ontario
6

Canadian Agents Wanted

Manufacturers of British made electric motors and dynamos want established houses to represent them in all Canadian cities. Specialities, continuous current motors and dynamos, ⅛ H.P. to 100 H.P. 2 and 3 phase motors ¼ to 100 H.P. 1 phase motors ¼ to 10 H.P.

WRIGHT & WOOD, Limited,
Halifax, England.
6

Engines, Generators and Boilers

FOR SALE

in good order and Condition

Rollers

1 Robb—Mumford boiler rated at 150 H.P.; working pressure 125 lbs, per square inch; heating surface 1220 sq. ft., Grate surface 24½ sq. ft.; built 1898. Some tubes require renewal.

1 Cornish boiler, built by the John McDougall Co.; working pressure 80 lbs per square inch; heating surface 224 sq. ft.; grate surface 8½ sq. ft.

Engines and Generators

2 75 kilowatt direct connected engines and generators. Each engine has a cylinder 13" diameter by 14" stroke, suitable for 120. lbs working pressure.

Each generator is of 600 amperes capacity at 115 to 150 volts direct current, and runs at 270 revolutions per minute.

Unit No. 1 consists of a Robb engine connected to a Crocker-Wheeler generator.

Set No. 2 consists of an Ideal engine connected to a Canadian General Electrric Generator.

These sets are both 9 years old They can be seen running at any time by appointment.

The machinery is offered for sale as it stands in the Macdonald Engineering Building, McGill University, Montreal, and purchaser must undertake removal.

W. VAUGHAN 5
Bursar, McGill University.

Draftmen wanted by large electrical manufacturing company in Canada. State experience and salary expected. Address Box Number 962 Electrical News, Toronto, Ont. 5

City of Winnipeg Electrical Distribution System

Tenders for Conduit and Sub-Stations

Sealed tenders on perscribed forms, addressed to the Chairman of the Board of Control, Winnipeg, Canada, and marked on the envelope "City of Winnipeg Electrical Distribution System—Tender for.................." will be received at the offices of the undersigned up to 11 a.m., on MONDAY 16TH, MAY, 1910, for the following items:—

No. 51 Conduit.
No. 52 Construction Conduit Runs, 1910.
No. 53 Sub-Station Transformers and Switching Apparatus.

Copies of the plans, specifications, and forms of tender will be obtained at the Power Engineer's Office, Carnegie Library Building, Winnipeg.

These specifications may also be examined at the offices of Messrs Smith, Kerry & Chace, Confederation Life Building, Toronto, Ontario.

Each tender must be accompanied by a certified cheque, as set forth in the "Instruction to Bidders" which cheque will become forfeit to the Corporation in the event of the successful tenderer refusing or neglecting to sign a satisfactory contract when called upon so to do.

The City reserves the right to reject any or all tenders or to accept any bid which shall appear advantageous.

M. PETERSON,
Secretary.
Office of the Board of Control,
Winnipeg, April 14th, 1910. 5

Sunbeam Tantalum Lamps

For Series Burning

Best for Street Railway Lighting

Write for Prices

The Sunbeam Incandescent Lamp Co.
of Canada, Limited

Members of The National Electric Lamp Association

TORONTO WINNIPEG

Recent Canadian Patents.

124268.—R. P. Moodie and C. W. Bell, Ottawa, Ont., electric irons. The improved iron is provided with recess in which are placed cores of resistance wire. The wire is prevented from coming in contact with the walls of the recesses by providing annular flanges on each end of the core. The iron also comprises another recess in which curling tongs may be heated.

124536.—J. J. Fanning, Cantley, Que., automatic switching mechanisms, J. J. Fanning and Thos. F. Nellis. The switch point of the device, which is especially designed for street car railways, is provided with an armature which is acted on by an electro magnet. The magnet is operated from the car by means of two contact arms controlled by the foot of the motorman, so that when one arm is pressed into contact with the rail and hence with the magnet, etc., switch point is diverted to one side, whilst if the other arm is operated the point swings to the other side.

124409.—E. Bigelow Hosmer and W. N. Deitrich, Montreal, Que., electrical safety devices. The invention provides means for protecting an electric circuit when the latter is accidentally grounded or overloaded. The novelty consists in connecting one end of the coil of a magnet to one side of the circuit and connecting the other end to the ground. An additional coil is connected in series with the other side of the circuit constituting an auxiliary part of the magnet. Means are provided for opening the circuit when either of the coils is energized.

124500.—A. Stansfield, Montreal, Que., thermo electric pyrometers and the like. The invention relates particularly to the thermo couples used commercially in connection with thermo-electric pyrometers. The couple comprises a graphite tube in which is placed a rod of carbon or other similar substance thermo electrically different from the graphite of which the sleeve or tubular member is composed. The rod and sleeve are insulated from each other except at the fire end of the couple where they are electrically connected.

MOONLIGHT SCHEDULE FOR MAY

(Courtesy of the National Carbon Company, Cleveland, Ohio.

Date.	Light.	Date.	Extinguish.	No. of Hours
May 1	7 20	May 2	3 10	7 50
2	7 20	3	3 10	8 20
3	7 20	4	4 10	8 50
4	7 30	5	4 10	8 40
5	7 30	6	4 10	8 40
6	7 30	7	4 10	8 40
7	7 30	8	4 10	8 40
8	7 30	9	4 10	8 40
9	7 30	10	4 10	8 40
10	7 30	11	4 10	8 40
11	7 30	12	4 10	8 40
12	7 30	13	4 00	8 30
13	10 50	14	4 00	5 10
14	11 30	15	4 00	4 30
16	0 00	16	4 00	4 00
17	0 30	17	4 00	3 30
18	0 50	18	4 00	3 10
19	1 10	19	4 00	2 50
20	1 40	20	4 00	2 20
21	2 00	21	4 00	2 00
22	No Light	22	No Light	
23	" "	23	" "	
24	" "	24	" "	
25	7 50	25	10 30	2 40
26	7 50	26	11 30	3 40
27	7 50	28	0 20	4 30
28	7 50	29	1 10	5 20
29	7 50	30	1 40	5 50
30	7 50	31	2 10	6 20
31	7 50	June 1	2 40	6 50
		Total	....	165 30

HEAD OFFICE
PRESCOT, ENGLAND

Capital $7,300,000.00

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Liverpool, England

British Insulated & Helsby Cables
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Power Building, MONTREAL

Electrical News
Generation, Transmission and Application of Electricity

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ADVERTISEMENTS.

Orders for advertising should reach the office of publication not later than the 20th day of the month preceding date of issue. Changes in advertisements will be made whenever desired, without cost to the advertiser.

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EDITOR'S ANNOUNCEMENT.

Correspondence is invited upon all topics coming legitimately within the scope of this journal. Subscribers can materially assist by sending in news items and information regarding electrical development in all parts of Canada.

Vol. 19 Toronto, June, 1910 No. 6

The Mimico Tragedy

One is greatly tempted to use a stronger word than tragedy. A young life has been cut off as the direct result of acknowledged incompetence, criminal neglect and apparently deliberate disregard for the lives of the citizens of Mimico. The summarized conditions are as follows: The company had never had previous experience in stringing aluminium wire and were ignorant of the requirements in the installation of such a line; the size of wire used to carry 12,000 volts was No. 6 instead of being at least No. 2, nearly four times bigger, as correct practice would demand; the tieing in was done with wire of the same size, No. 6, instead of a much smaller size; and finally the break was reported at 9 a.m., the little girl was killed at 2.30 p.m., the wire was only being repaired at 4-5 p.m.

It is possibly a difficult matter to place one's finger on the one individual who is most to blame in this terrible affair, but the neglect to order immediate repairs when the break was reported at 9 o'clock can only be laid on one man's shoulders. Some one must have had charge of this line and it is to be hoped the authorities will succeed in identifying him, and will require whatever atonement the law allows. The original cause of the tragedy, however, rests with the government, which was comfortably unaware that such dangerous death traps were being erected along the public streets of Canadian towns. It is incredible, but true, that neither the Dominion nor Ontario government has ever taken active steps to regulate the erection of high tension transmission wires. There is no competent inspector nor any law by which the inspector, if appointed, would be given authority to demand a safe standard.

It is useless enough to bemoan what cannot now be prevented, but repetition of such an occurrence is due again any day, under present conditions, in different places throughout the Dominion. If the governments value the lives of their people there is only one course open now—to immediately draw up a series of regulations, as are in existence all over the Old Country, prepared by *competent* engineers, that shall make the erection of such flimsy death-traps an impossibility, and then appoint impartial, experienced and vigilant inspectors who shall enforce the law to the last letter. No other course is at all adequate and no less vigorous measures will condone for past neglect and fatal delay. The commandment, *Thou Shalt Not Kill*, is otherwise disregarded.

The Toronto Railway Situation

Once more the Toronto Railway question has been submitted to what must be acknowledged as an impartial court, with the same result as on all previous occasions. It is evident that, in the opinion of the Railway Board, the Toronto authorities have been placing needless obstacles in the way of street railway extensions. This has also been the opinion of the majority of well-informed citizens for the last year or more. In the unequal contest between experienced and inexperienced railway men, the chances have always been in favor of the ultimate success of the party which was thoroughly conversant with railway conditions and requirements. The city council, by its policy of blockade, has done untold harm to Toronto and caused indescribable inconvenience to the citizens, while the railway company can scarcely be judged to have lost anything in revenue. Indeed, it is quite believable that the percentage earnings have been greater than if the desired extensions had been built two years ago. The average citizen will now certainly heave a big sigh of relief if he can be assured that the council will no longer continue their obstructive policy. In view of the varied interests involved, this last decision ought to be accepted with a good grace and the railway company given an immediate chance to make good its suggestion that sixteen miles of new track may be completed by the end of 1910.

An Underwriters' Testing Laboratory

The necessity of a properly-equipped testing laboratory where new electrical apparatus could be subjected to the careful inspection of competent and impartial judges before being placed on the market would often work to the advantage of the manufacturer or the central station quite as much as to the purchaser. A case has recently come to our notice where a new automatic iron, cleverly devised, was handed for approval to the chief electrician of one of our large cities and, after inspection, condemned as being improperly insulated and so, liable to expose the user to severe shock. It was also shown that the current actually consumed by the iron was 50 per cent. in excess of the amount, marked on it, which the device was stated to consume. As a result the sale of this iron was forbidden in that city.

The case in point is, without doubt, an exception, but one can scarcely over-estimate the harm that the distribution of even a small number of such defective appliances may do. The report of one single accident from defective insulation in a large town would be enough to condemn all makes, good and bad, of that particular kind of electrical apparatus. Nor is the practice of deception as to the amount of power actually consumed any less harmful. Electrical apparatus, properly manufactured, will win on facts and these should be plainly and openly stated.

There is little doubt but that manufacturers of electrical household apparatus would welcome the establishment of a standard that would prevent such unfortunate occurrences as the above. And it is almost a matter of surprise that the various standard companies have not, for their own protection taken steps towards the establishment of a well-equipped standardizing laboratory. Even without government support it would then be possible to say that a certain piece of apparatus which may have caused trouble, had not been approved by their laboratory inspector, and, in this way, a distinction would be drawn between approved and non-approved appliances.

A government standard and government inspection, however, appears to be not only a very simple, but also the most logical solution and to this end we believe the underwriters' association should not be alone in their efforts to establish such a standard, but that the scheme should receive the hearty support of every manufacturer as well as every user of household electrical goods.

The Farmer and the Telephone

Did you ever stop a moment to consider what would be the effect on to-morrow's business if, to-night, all telephones and telephone connections were arbitrarily removed from the city of Toronto? It is safe to predict that one day's experience would find us ready to barter street railways, electric light, telegraphs, or anything else, for its return. And if this is true of a community huddled together as people in a business centre of a great city are, how much more must it apply to the farming community, where distances are great and transportation difficult. The wonder is that all farmers do not themselves see, what is plain as day to the onlooker, that telephones would mean precious time saved, better buying and selling, protection to life and property, and a readier interchange of ideas.

The telephone stands in much the same relation to the farming communities as a general does to an army of men, and no one who knows the sterling worth and undoubted ability of the vast majority of Canadian farm owners can feel otherwise than that much splendid energy is being dissipated, and many able men living brave isolated lives for very failure to grasp the idea that the telephone which is at everyone's disposal for a few dollars, has proven without exception, in every community where it has been placed, that community's biggest and most valuable asset.

Some such idea must have inspired the artist of a recent publication which bears the name of the Canadian Independent Telephone Company, and is ostensibly issued for advertising purposes, but in which the life of a farming community is so absolutely accurately portrayed, with its troubles and sadness which are so common, and its brave deeds that are often so helpless, and in which in a most artistic manner the telephone has been made to transform all this. And yet there is no suggestion of the impossible or unreal—everywhere the installation is completely reasonable, practical, and, almost beyond belief, helpful. If we mistake not, this artist, by his wonderful portrayal of farm conditions, has done more for the establishing of rural telephones than an army of agents in many months, and we congratulate this telephone company on its very human publication.

15,000 Hours for a Tungsten Lamp

It would appear that English experience in the life of tungsten lamps is, so far, more encouraging than results on this continent have led us to hope for, at least, in the immediate future. Speaking on this matter, the Electrical Times, London, Eng., of April 14 states that it is quite common for tungsten lamps to remain in commission, while maintaining closely their efficiency and initial candle power, for periods exceeding 3,000 hours and quotes an instance, just to hand, of an Osram lamp of 100 c.p. which had given out after burning continuously for 15,643 hours, the light being satisfactory right to the end. The item also states that many instances are known of tungsten lamps having run for periods between 5,000 and 10,000 hours, and an instance is quoted of a tantalum filament lamp in continuous use since May, 1906, and still giving good service.

Such a long life, however, is by no means necessary to make tungsten lamps a financially safe investment. Suppose a 16 c.p. carbon lamp costing 20 cents lasts 800 hours, the total expense becomes:—

1 lamp at 20 cents	$0.20
60 watts for 800 hours at 10 cents per k.w.h.	4.80
Total cost for 800 hours	$5.00

Again, suppose a 16 c.p. tungsten lamp costs 70 cents and lasts only 200 hours, total expense becomes:—

4 lamps at 70 cents	$2.80
24 watts for 800 hours at 10 cents per k.w.h.	1.92
Total expense for 800 hours	$4.72

These figures show that a tungsten lamp need only last one-quarter as long as a carbon to make the expense of the two light-systems about the same. When such long life as that mentioned above shall have become everyday practice, competition from other systems of residence lighting will not be a very serious factor.

The C. E. A. Convention

This year's convention of the Canadian Electrical Association will offer a splendid opportunity for a holiday. A sojourn in Muskoka in the month of July is always enjoyable, and with the added interest of the convention, there should be little to be desired. The convention will be held, as previously announced, at the Royal Muskoka Hotel, Lake Rosseau, Wednesday, Thursday and Friday, July 6th, 7th and 8th, but many persons will no doubt arrange to take a full week's holiday.

The arrangements are progressing favorably and are in charge of the following committee: Messrs. W. L. Adams (Chairman), R. G. Black, R. F. Pack, W. A. Bucke, Valentine Boyd, T. F. Dryden, W. M. Andrew, T. J. Lynch, T. R. Fulton, P. S. Coate, Geo. C. Rough, A. L. Mudge, C. H. Mitchell and T. S. Young.

What may be termed the business sessions of the convention promise to be unusually interesting. The programme will include excellent papers and reports covering such subjects as "Rates," "The Commercial Agent and His Relation to the Public," "The Attitude of the Central Station Manager Towards Illuminating Engineering," "Uniform Accounting," "Installation, Care and Testing of Meters," "Standardization of Line Construction," etc.

A feature of the entertainment will be a baseball match between the Manufacturers and Central Stations, an event which, it will be remembered, afforded much enjoyment at the Toronto convention two years ago. Mr. Geo. C. Rough, of the Packard Electric Company, 26 Adelaide street west, Toronto, is arranging the team for the Manufacturers, while Mr. L. V. Webber, of the Toronto Electric Light Company, will look after the Central Station men. These gentlemen specially request that members who desire to play on the respective teams should communicate with them, in order that the arrangements may be completed in advance of the convention.

Quebec Merger Making Big Extensions

The Quebec Railway, Light, Heat & Power Company contemplate an extension of their railway from Maple avenue, in the town of Montcalm, through St. Colomb de Sillery to the top of Sillery Hill, a distance of two and a half miles. This will bring the line to a point not far distant from the site of the new Quebec bridge on the north shore.

Many extensions and improvements are being made at Montmorency Falls Park, the principal one being the extension of Kent House, which is being enlarged to three times its present capacity.

The Rustic Theatre is being enlarged and over the seating area, which will accommodate eighteen hundred people, a roof is being erected.

A building for a new Caroussell, with promenade and lookout on top, has just been completed, and the company is now in receipt of the necessary machinery, for which the order was placed in New York. This will be the largest of its kind in Canada.

Tenders have been awarded for the demolition of the Jacques Cartier market building and cabans, to make way for the erection of the company's new office building, which will be of structural steel, fireproofed, eight storeys high and will occupy an entire block. The first three floors will be required for the offices of the company, with the exception of one corner on the ground floor, which the management proposes to fit up for bank premises.

Storage Battery on Fluctuating Load

The D. P. Battery Company, Limited, Bakewell, Derbyshire, England, have issued a little booklet dealing with the advantages of a storage battery and reversible booster in connection with any load which is subject to fluctuations. A specific case is cited, very clearly and practically outlined, which compares, from different viewpoints, the operations of a generating station using (a) Diesel oil engines, as the prime movers, and (b) the same oil engines plus battery and booster. The following comparisons are taken from the booklet and were made from actual operations.:

	Without Battery	With Battery
One gallon of oil produced units of energy...	10.2	12.3
Pounds of coal to produce one B.h.p..........	580	474
Total first cost of generating plant to supply a peak load of 450 k.w.................	$61,000	$50,000
Fixed yearly charges after installation.....	$6,100	$5,420

The yearly saving on all charges in a plant of 450 k.w. capacity is placed at $1,305, made up as follows: Saving on fixed charges, $680, on fuel $350, on engine room stores $150, on repairs $125.

It does not appear that the above figures are over sanguine for any case where the load varies by large amounts and where the peaks are of short duration. The objection to installing generating units large enough to take care of the peak loads easily, lies not alone in the fact of greater capital expenditure, but in the further fact that the large unit operates at a very low efficiency when on light load. The need of a good auxiliary, such as the battery and booster supplies, has for some time been fully recognized, but the trouble has chiefly been with the short life of the batteries. Marked improvements have, however, been made in the construction of these in very recent times, and the near future will probably see a storage battery included in the essential parts of every efficient installation.

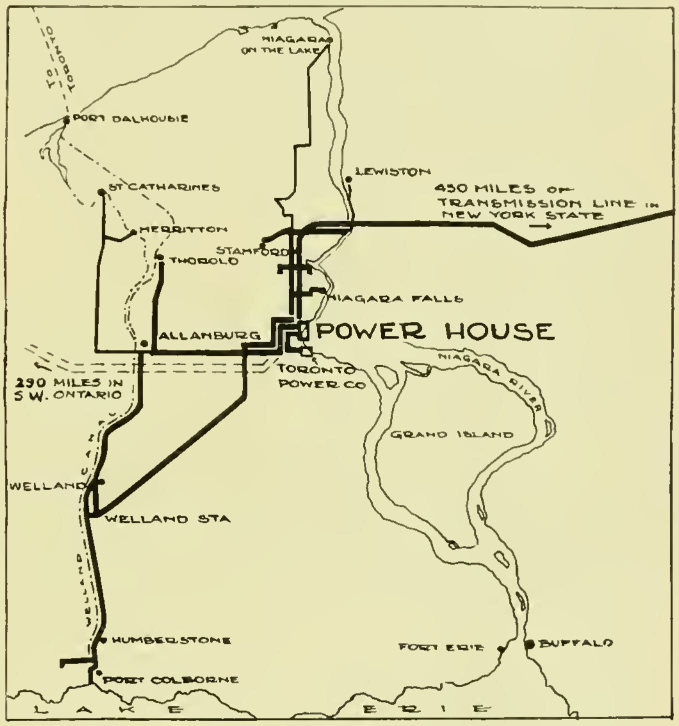
The Ontario Power Company's Lines

The accompanying map represents that part of the Canadian distributing system of the Ontario Power Company, of Niagara Falls, Ont., which is directly under the control of this generating company. It was the original plan of the Ontario Power Company to extend transmission lines westward covering the more populous section of southwestern Ontario, but this scheme is abandoned in view of the well-known arrangement with the Ontario Hydro-Electric Power Commission by which the Commission purchases power from the Ontario Power Company at its generating plant. The plan of distribution followed by the Power Commission, which transmits on steel towers at 110,000 volts, was fully described in a recent issue. The total length of this transmission system is about 290 miles.

The lines which cross over the Niagara river to serve New York State are also carried on steel towers. The voltage on this line is 60,000, the highest that had been used at the time of the construction of this part of the system, in 1905. A double line extends due east as far as Syracuse, including Lockport, Rochester, and many smaller points along the route; also south to Buffalo, and West Portland. Further extensions west to Erie are at present under construction. The total length of transmission line in New York State is about 450 miles.

The lines used for distribution in the Niagara peninsula, shown in the figure, transmit at 12,000 volts throughout and are carried on wooden poles. The total line length is about 90 miles and extensions now under way will soon bring this up to 100 miles. In the figure the heavy lines represent a double-pole system, the light lines a single-pole system. A feature of great importance to the company's customers is the connection with the Toronto Power Company's generating plant which insures a constant supply in emergency, due to accident or overload.

Incidentally this latter connection will doubtless, in the near future, and at intervals, create the anomalous position of the Toronto Electric Light Company and its rival, the City of Toronto distributing system, being supplied with electric energy from the same source.



Longest Transmission System in the World

Summing up the whole distribution system, 450 miles in New York State, 90 miles in the Niagara Peninsula and 290 miles in southwestern Ontario, a total of 830 miles, it is probably safe to say that the Ontario Power Company's system of transmission lines is now far and away the longest in the world, and that in point of efficiency and modern practice, it stands as yet unexcelled.

Maple Leaf will install A. C. B. Apparatus

The Maple Leaf Milling Company, who are building a large flour mill in Port Colborne, on Lake Erie, has placed the order for their complete machinery installation with the Allis-Chalmers Company, of Milwaukee, the electrical part of which will be supplied by the Canadian branch, the Allis-Chalmers-Bullock Company, of Montreal. This latter equipment includes transformers, motors, switchboards and all wiring requirements. There will be three transformers of 800 k.w. capacity each, which will take current from the high tension lines at 20,000 volts and reduce to 550 volts. The motors, sixteen in number, are as follows,—one 700 h.p., one 300 h.p., one 75 h.p., one 50 h.p., four 15 h.p., five 10 h.p., and three 7½ h.p., making a total generating capacity of between twelve and thirteen hundred horsepower. The installation will be in charge of the engineers of the Allis-

Chalmers and the A. C. B. companies, and is to be ready for operation by December 1st of the present year. The power is being supplied by the Dominion Power & Transmission Company from its main generating station at De Cew Falls, near St. Catharines.

Waterville, Quebec, Water Power Development

Plans have been completed for the development of a water power on the Coaticook river, about a mile below the town of Waterville, Quebec. The development will be somewhat unique in that the dam which will be of concrete and 45 feet in height, will have attached to it the power house, built into the downstream slope. A pressure chamber will be constructed right in the dam, where the turbine wheels will be located, with shafts extending through thimbles into the power house, for direct connection with the generators. Provision will be made for two 500 h.p. units, but only one is being installed at the present time. This will be used to supply the factory of Geo. Gale & Sons, Waterville, who will require about 250 h.p., and to light the towns of Waterville and Compton.

F. C. Davis, who has, during the past year, been constructing a hydro-electric plant for the town of Coaticook, has also been engaged as engineer in charge of the present installation.

Moose Jaw Street Railway

A limited liability company of Ottawa men has been formed to construct and operate a street railway in the city of Moose Jaw, Sask. The capitalization will be $500,000 and stock will very soon be placed on the market. A twenty-year exclusive franchise was granted to the company by the passing of a city by-law on April 19th, 1910. The company is to have in operation six miles of route within twenty months. A most modern system will be installed in keeping with the rapid progress of Moose Jaw. Six cars are to be put in operation from the first. These cars will be of the single-truck pay-as-you-enter-type, fitted with cross seats upholstered in rattan. Cars to be equipped with two 30 h.p. motors, electric heating, and to be of the convertible type.

The present layout consists of loops altogether, with double tracking along the main paved streets. Tee rails are to be used throughout—70-lb., 7-inch type, on paved streets, and 60-lb., 5-inch type on unpaved streets.

The generating plant will consist of high pressure, compound condensing engines, with water treating plant auxiliary engines. Extra generator and boiler sets will be installed to guard against any interruption of service.

Car barns will be large and roomy and will be constructed on the unit system, so that future enlargements will simply mean an addition of unit. Each unit will be 150 feet by 45 feet, with four tracks. Back of the barn will be the machine shop. Sixty feet of two tracks will have a pit 6 feet deep running under the rails. These pits will be provided with hydraulic drop pits. Pneumatic lifts, for handling of car parts, are to be installed also.

Tenders are now being let for complete layout, including ties, rails, trolley suspension, car barns, power house, cars and shop equipment.

Shawinigan Extensions of 75,000 h. p.

The rapid expansion in almost every phase of business enterprise which Canada continues to enjoy is again emphasized by the recent announcement of the Shawinigan Water & Power Company that their present plant will be more than doubled by the construction in the near future of a second power house close to the site occupied by the present generating plant at Shawinigan Falls, on the St. Maurice river. This point is about 85 miles from Montreal and 20 miles from Three Rivers. The present installation generates 55,000 horsepower. The new plant will be designed for 75,000 h.p. Figure 1 shows the relative positions of the power houses and the forebay. Even this large addition will not exhaust the capacity of the immense forebay, seen in the background, which is 100 feet wide and 20 feet deep at low water, and is calculated to give 150,000 horsepower. A second power site, owned by a subsidiary company, develops 1,200 h.p. at St. Narcisse on the Batiscan river.

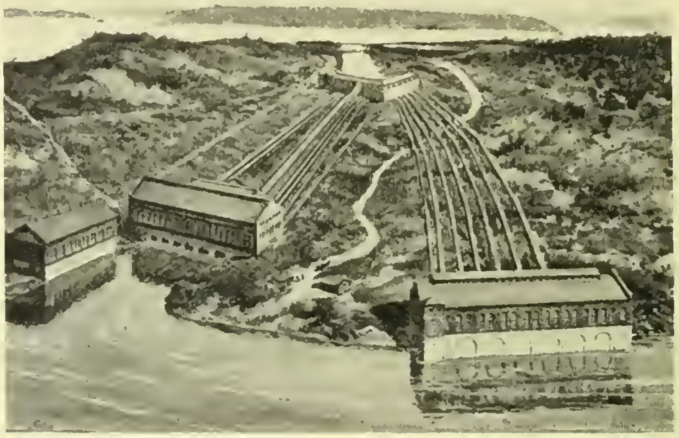


Fig. 1—On the left present 55,000 h. p. Generating Station.—To the right projected 75,000 h. p. Plant.

The transmission lines of this company now constitute the longest system in Canada. They are shown in the second figure. The original lines Nos. 1 and 2, which reach out to Montreal are each about 90 miles long. Lines 3 and 4 stretching east and south of the St. Lawrence, are each about 100 miles long. Including branch lines the total length is well over 400 miles. The current is generated at 2,200 volts and is stepped up for transmission both to Montreal and to the asbestos district, to 50,000 volts.

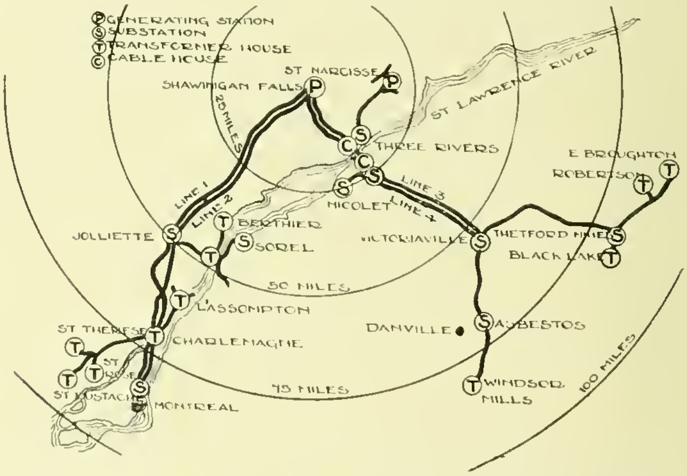


Fig. 2—Shawinigan Transmission System—Longest in Canada

The lines are aluminium cable carried on wooden poles. The capacity of the Montreal section is 25,000 h.p., 3,000 h.p. of which is supplied to the Montreal Street Railway, and 15,000 h.p. to the Montreal Light, Heat & Power Company. Before delivery in Montreal the voltage is reduced to 2,400 volts and, for the street railway, converted into direct current, while for the Light & Power Company, it is changed from 30-cycle to 60-cycle for distribution throughout the city. As will be seen also from the figure, a large substation at Charlemagne supplies the towns of St. Therese, St. Rose, St. Eustache and L'Assomption. Another substation at Joliette supplies Sorel and neighboring towns. These branch lines carry current at 12,500 volts.

The eastern lines are already supplying 7,000 h.p. to the Thetford district, and demand for power in this neighborhood is rapidly increasing. In addition to other large customers served by line No. 4, 2,000 h.p. is supplied to Danville and 1,000 to Windsor Mills, where the Canada Paper Company is located. In connection with this section the recent laying of the 25,000-volt submarine cable at Three Rivers, Que., proved an extremely interesting feat and required considerable preliminary arrangement before it was successfully accomplished. A barge 80 feet by 20 feet was employed in placing the cable in position and was fitted with special rigging 17 feet high, which was necessary to handle this tremendous weight. The task may be better gauged when it is understood that the weight on the barge due to the cable, was no less than 80,000 pounds. The cable was made in one solid piece 7,000 feet long.

It is also of interest to note that the Shawinigan Company supplies water power (undeveloped) to the Northern Aluminium Company to the extent of 25,000 h.p., to be increased to 30,000 on demand, and to the Belgo-Canadian Pulp & Paper Company to the amount of 14,000 h.p. These amounts, with the exception of 10,000 h.p., are obtained at a second dam about a mile up stream, which supplies the turbines of the above-named manufacturing companies, through penstocks 12 feet in diameter, for the generation of direct current.

The Shawinigan Water & Power Company has recently issued an attractively illustrated booklet describing their whole system, and wherein the suitability of their district as a manufacturing location, is dwelt upon at length.

Brockville Building New Power Plant

The Town of Brockville is building a new electric station adjacent to the present waterworks on the St. Lawrence river, and will remove a portion of the machinery from the present electrical plant so that with the new equipment the power house will have a capacity of 700 horse power. Three units of 100, 150 and 300 kilowatts, respectively, will be erected, the latter being the principal addition to the plant. The 300 k.w. unit will be driven by a 450 h.p. vertical high speed engine.

The construction is proceeding under the direction of the power and light commission of the town, and directly under supervision of Charles Wilkinson, the superintendent of the department. The town recently passed a by-law providing for an outlay of $50,000 for the extension of the gas plant (also a municipal department) and for the rebuilding of the electric station. The changes in the electrical system are the results of the public utilities report of C. H. and P. H. Mitchell, submitted about a year ago, which firm is now acting as consulting engineers for the town.

One feature of the change is to be especially noted. The present system is two-phase necessitating the rewinding of the armatures of the 100 k.w. and 150 k.w. generators and the re-arrangement of the distributing conductors. It is of course expected that any hydro-electric system operating in the district will be three-phase, so it has been considered an opportune time to change over from two to three phases.

Winnipeg Power Scheme's Progress

Progress in Winnipeg's municipal power scheme for the month of April is reported by Smith, Kerry & Chace, the city's consulting engineers, as follows: An average of 350 men have been engaged during the month by John Gunn & Sons, contractors. The first shipment of structural steel has left the works of the Canadian Bridge Works. The Manitoba Bridge & Iron Works have shipped three special towers; the total number of towers shipped now totals 622. The Williamson Construction Company assembled 18 towers; footings were placed for 21 more. Arrangements are complete for the fencing of the right of way; about 6,000, or about one-third of the total number of posts, is to hand and the wire is ordered; Messrs. Bishop & Mills have the fence contract. Claydon Bros. have about completed the excavtions for the terminal station. Reports from Kristineham state that steady progress is being made with the turbines; one exciter is already assembled. The total expenditure to March 31st, 1910, on the power scheme amounts to $1,200,232.

Power Development at Wilson's Falls

Canadian Contracts, Limited, of Toronto, have under construction for the town of Bracebridge, at Wilson's Falls, on the north branch of the Muskoka river, about a mile north of the town, a plant to develop about 1,200 h.p. This has been found necessary on account of the present plant being heavily overloaded and an increasing demand for power from the town's manufacturers. Contracts have been awarded to William Kennedy & Sons for the hydraulic machinery, consisting of one pair 30-inch turbines of the very latest design for driving generator, one 12-inch turbine for exciter and one Monneret governor. The Canadian General Electric Company will furnish the electrical machinery, consisting of one 750 k.w. generator, the exciter and a marble switchboard complete with all necessary instruments. The transmission line will be of aluminum wire, and is being furnished by the Northern Aluminum Company.

The total cost of the development will be about $45,000, and when complete, will be one of the most up-to-date plants in the province. After allowing for the overload on present machines and supplying the power already contracted for, the town will have a surplus of some 500 h.p. to supply to manufacturers at the low price of $12.50 per horsepower per annum for 10-hour service, or $15.00 for 24-hour service. It was expected to have the plant in running order by the beginning of June, but owing to high water and delays in delivery of machinery it is not likely to be ready before August.

The Pacific Pulp and Power Company

The Pacific Pulp & Power Company is just being organized in Montreal. The company have secured about 15,000 acres of timber land comprising chiefly pulpwood and cottonwood on the Skeena and Naas rivers, in the neighborhood of Prince Rupert, B.C., and will carry on a general lumber business It is also their intention to generate a considerable amount of electrical energy at Union Creek, sixteen miles from Port Simpson and thirty miles from Prince Rupert. The first development will be approximately 15,000 horse power. The head for this development is to be obtained from four lakes, the Union, the Deep, the Second and the Fourth. The power developed will not only be utilized in operating their sawmills, but they intend also to supply electric light to Prince Rupert and Port Simpson, as well as operate an electrical road between these two places. In fact, their operations will extend for a radius of 75 miles around Prince Rupert. Messrs. Ross & Holgate, consulting electrical engineers, have been appointed to make a report upon the project and their representative engineer, Mr. H. L. Trotter, is out on the Coast at present investigating the conditions.

The Sherbrooke Railway and Power Company

Following the securing of a charter to develop power on the Magog river and to extend the present Sherbrooke street railway system, the Sherbrooke Railway & Power Company have just let important contracts for the electrical and hydraulic equipment required for their first power development, aggregating approximately $70,000.

The Jenckes Machine Company, Limited, Sherbrooke, were awarded the order for the complete hydraulic machinery and will build and install the three main turbines, equipped with 24-inch gate valves, and all accessories. The three governors are Lombard construction, style Q-10.

The electrical units will be supplied by the Canadian General Electric Company, Limited. They will instal three 750 k.w. generators, two 50 k.w. exciters, three 650 k.v.a. transformers, two 250 k.w. motor generator sets, one 9-panel switchboard, all wiring, etc.

The contract for the erection of the dam, penstocks, power house and various incidental construction work has not yet been let, but it is expected that this work will be rushed through and completed by August, the company hoping to deliver power in November of this year. As before stated, Messrs. Ross & Holgate are the consulting electrical engineers who have this project in hand. Frank Thompson & Company, of Montreal, are also interested.

Power Development at Minnedosa

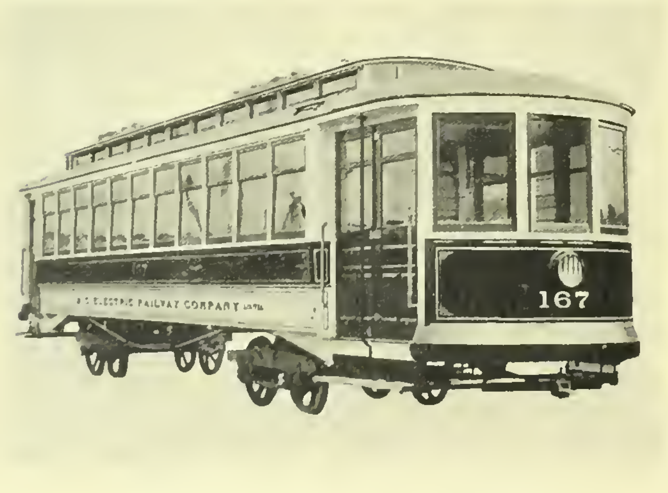
The Minnedosa Power Company, of Minnedosa, Man., is developing the Little Saskatchewan river, a short distance above the town. The Little Saskatchewan rises in the Riding Mountains and has a large drainage area centering in Clear Lake about 150 miles up the river from the power site; a regulating dam is to be built at Clear Lake.

At the power site the river is about 100 feet wide with high banks about 2,000 feet apart. The construction of the puddle core earth dam is now under way to raise the water to form a lake about three miles long, 2,000 feet wide and 25 feet in depth; the head obtainable by this means is 24 feet under low water conditions and the flow will produce a minimum output of 1,000 horsepower. The initial generating equipment will consist of a 450 h.p. turbine and generator, and a 40 h.p. exciter unit. Power will be distributed in the town for municipal lighting and power purposes. The company owns the present steam electrical plant.

The head office of the company is in Minnedosa; P. J. McDermott is president and H. F. Maulson, secretary. The dam is being constructed by Snyder Bros., of Portage la Prairie; tenders have been received on the equipment and works construction. The installation is under the supervision of C. H. and P. H. Mitchell, engineers, Toronto.

Five New Cars for B. C. Electric Railway

An order of five cars has just been shipped from the Ottawa Car Company's shops to the B. C. Electric Railway Company, of which the following is a detailed description. They are semi-convertible, pay-as-you-enter type; double control; monitor roof; interior finish, California red cherry; head linings, birds eye maple; polished bronze fittings, bunters, draw bars, alarm gongs, and signal bell.



One of B. C. E. Ry's New 30 foot Coaches

Length of car body is 30 feet 10 inches; length rear vestibule, 7 feet; projection of bunters, 6 inches; length of car over bunters, 45 feet, 10 inches; width of car over side posts, 8 feet 6 inches; height of car from bottom of sill to top of roof, 8 feet 9 inches; estimated weight of car body, 17,000 pounds; seating capacity, 40.

The end sills are of best oak, mortised and tenoned, reinforced with 16-foot by ⅜-inch iron plate. The entire frame is tied together with ⅝-inch round steel rods. The flooring is ⅞-inch tongue and grooved hard yellow pine laid lengthwise. Truss beams and 6-inch eye beams extend full length of the car bottom, and are securely bolted to same. Steps are of disappearing type, wooden treads.

Interior of B. C. E. Ry's New 30 foot Coaches

Interior finish of car is of most modern design; all panelling and mouldings, etc., are of Georgia red cherry, smoothly finished and highly polished. Window guards, blinds and curtains are provided. Skylights are glazed in high class English glass. Iron pipe railings are provided in vestibules and centre exit hand rail. There are push buttons in each side post.

The exterior of the car is carried out in a very harmonious combination of green, white and gold. Headlights are Crouse-Hinds type Z. There is an electric bell in front; and sanders at each end of the car. The cars, as shown in the accompanying photograph, are only mounted upon temporary trucks for shipment.

The Hydro-Electric Situation in Western Ontario and Manitoba—Immense Water Power Available

Special Correspondences to the Electrical News

Within the past few weeks there has been evidence of an awakening interest in the hydro-electric possibilities of Manitoba and Western Ontario. For the past year or two financial difficulties have kept the capitalist engaged in looking after obligations already undertaken, but now that a wave of prosperity has come, the man with money to invest is again upon the scene, and propositions are being made and discussed, and rejected and accepted so rapidly in the central part of Canada that it is well-nigh impossible to keep in touch with the latest developments.

Although it was prophesied by the Board of Consulting Engineers who reported on the water supply of Winnipeg in 1907, that the city's population would reach the 300,000 mark by 1920; and although Winnipeg is looking forward to an international exposition in three or four years, it is probable that the combined capacities of the 20,000 horse power plant of the Winnipeg Electric Railway Company at Lac du Bonnet, and the 60,000 horse power municipal plant at Point du Bois will be sufficient for the city's needs for a number of years to come. It is, therefore, not to Winnipeg, but to the rapidly-growing though at present, small, towns and cities of Manitoba and Western Ontario, that the hydro-electric investor and promoter are looking for a market.

In view of this interest that is being displayed it is an opportune time to glance at the country around Winnipeg and speculate on its possibilities, not so much of to-day as of ten or twenty years hence.

The principal places within 150 miles east and west of Winnipeg are tabulated below:

Place and Distance from Winnipeg.	Population.
Kenora and Keewatin, 133 miles east..........	6,150
St. Boniface, 1 mile east....................	5,100
Selkirk, 18 miles north	3,000
Portage la Prairie, 55 miles west............	6,500
Carberry, 105 miles west	1,200
Brandon, 133 miles west	13,000

Kenora and Keewatin, situated at the foot of the Lake of the Woods, have recently developed from small lumbering and mining towns and summer resorts into a flour milling centre, and in the near future it is not unlikely that the manufacture of pulp, on an extensive scale, will be added to the industries of these places.

St. Boniface and the surrounding suburbs are thought by many to be the future manufacturing districts of Winnipeg, in view of the high prices now being paid for real estate in the city proper.

Selkirk is a quiet little town north of Winnipeg, which owes its existence largely to the farming district with which it is surrounded and to the wealth of the fishing industry on Lake Winnipeg.

Portage la Prairie supplies a rich farming district and is growing rapidly. There are four railroads entering the town, the Canadian Pacific, the Canadian Northern, the Great Northern and the Grand Trunk Pacific.

Carberry is a small town which is not likely to grow very much beyond its present size.

One of the most solid and business-like cities in the West is Brandon. Unlike most of the Western places, Brandon has never had a boom, but has grown and is growing steadily and is destined to become one of the large manufacturing and distributing centres of the West. Brandon has a number of large flour mills in operation, and others in course of construction, as well as numerous manufacturing establishments doing a flourishing business.

Three Power Propositions.

In spite of the fact that all these places are already supplied with electricity from one source or another, the promoters have been pointing out the great advantages to be derived from large quantities of power available at low prices. Conspicuous among the propositions which have been put forward are three, of which one comes from the Great Falls Power Company, a second from the Reese Engineering Company, and a third, which contemplates the supply of power to Brandon only, from local interests represented by Mr. Cecil B. Smith, C.E.

The Great Falls Power Company have been negotiating through their representative to furnish Brandon and Portage with 2,500 horse power each at $25 and $20 respectively, and St. Boniface with 5,000 horse power at $18 per horse power per annum, and an additional 5,000 in blocks of 100 horse power at $17 as the need arises. The council of St. Boniface has accepted this offer under certain conditions, including a deposit of $20,000 to be made within a specified time, and penalties for interruptions to service after the plant is in operation. The negotiations with the other two cities are still pending.

Mr. Cecil B. Smith has proposed to furnish Brandon with 2,000 to 3,000 horse power at prices varying from $36 to $52.50 per horse power per annum, for power purposes on a flat rate, and from 8 cents to 6.8 cents per kilowatt hour for lighting on a meter basis. Mr. Smith's proposition involves the development of a low head fall on the Assiniboine river about eight miles below Brandon.

Long Distance Transmission.

It is interesting to note the great distance over which these companies, with the exception of the one represented by Mr. Smith, propose to transmit their power. The Great Falls are situated on the Winnipeg river, at a point just below Lac du Bonnet, and are roughly, 75 miles from St. Boniface, 110 miles from Portage la Prairie, and 190 miles from Brandon. There are really two falls at this point, one of 34.09 feet descent, and the other of 8.85 feet. According to a report prepared for the Dominion Government in 1908, these falls are together capable of supplying about 94,000 gross horse power. On a basis of a flow of 16,000 cubic feet per second, however, a very conservative figure used by the engineers of the Point du Bois development, there would be about 62,400 horse power available from the Great Falls at the generator couplings, allowing a turbine efficiency of 80 per cent., and assuming the whole flow of the river to be utilized.

The power which the Reese Engineering Company propose to develop is at the Norman dam which controls one of the channels by which the Lake of the Woods empties into the Winnipeg river between Kenora and Keewatin, a distance of about 125 miles from St. Boniface, 180 miles from Portage la Prairie, and 258 miles from Brandon.

If these two propositions are carried to completion, it will be interesting to note the methods of coping with the engineering difficulties to be met with in profitably transmitting comparatively small quantities of power over relatively long distances. The Wininpeg river in its 150-mile journey from the Lake of the Woods to Lake Winnipeg, makes a total descent of 315 feet. For the greater part of this distance, i. e., below the point where the English river joins the Winnipeg, the minimum flow may be assumed to be approximately 16,000 cubic feet per second. It is evident, therefore, that in the undeveloped powers of the stream there are great opportunities awaiting the capitalist, provided a market for the power can be obtained.

In this connection it has been estimated that there is sufficient pulp wood in the region drained by the Winnipeg river and its tributaries, to require for its manufacture into pulp a permanent supply of 500,000 horse power, on a basis of cutting over the same ground not more than once in twenty years. The gradual deterioration of the soil which may be expected in the West, due to crops of wheat being taken from the same ground year after year without rotation, will no doubt in time create a demand for the nitrogen fertilizers which can only be manufactured where cheap hydro-electric power is available. Flour milling and the manufacture of cement may also in time call for additional power, and it is, therefore, gratifying to know that nature has provided in the Winnipeg river a source of energy sufficient for all the power requirements of the present generation at least, in a country where coal might almost be classed as a luxury.

Scott & Rubenstein vs. Midland Electric Co.

The following letter has been received referring to an article in our last issue:

Editor, Electrical News.

Dear Sir,—I note, in your last issue of the Canadian Electrical News, a reference to the case of Scott and Rubenstein vs. Midland Electric Company, in which it is pointed out that the case was decided in favor of the Midland Electric Company on all points. This statement is quite incorrect, for in point of fact, the claim of Scott & Rubenstein was maintained to the extent of $249.55, as will appear on reference to the judgment itself. Scott & Rubenstein were, therefore, justified, after notice to the Midland Electric Company, to go into the market and buy lamps to supply their customers, which they did—and their right to do so was maintained, and their claim allowed to the extent of $249.55. In view of this statement, plus the judgment of the trial court, we think that the questions involved in this case may be still considered as open, and that it is entirely a question of interpretation of the contract in each case.

Yours truly,
(Signed) M. RUBENSTEIN.

Montreal, May 3rd, 1910.

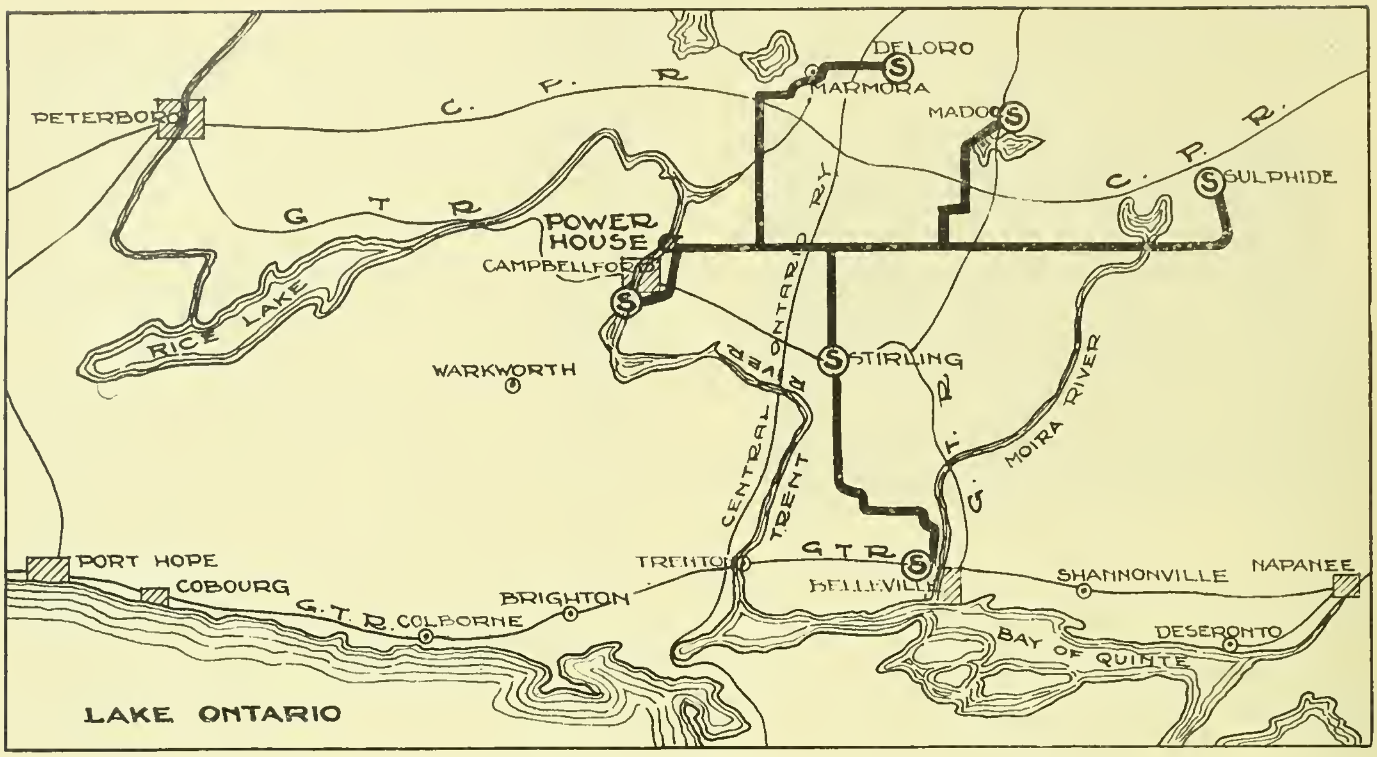


Fig 1—Transmission Lines of Seymour Power & Electric Company, Campbellford

The Seymour Power and Electric Company

Taking Advantage of Government Dam—An Important Section of Ontario now well Supplied with Power—C. G. E. Generators—Westinghouse Transformers

An interesting low head development which well illustrates the modern possibilities in the conservation of our water powers was placed in operation during the month of December, 1909, by the Seymour Power & Electric Company, Limited. The power station is located near Government dam No. 1, section No. 5, on the Trent Valley canal, about a mile above the town of Campbellford, Ont., where an operating head of twenty-three feet is available. The station will have a total rated capacity of 3,000 k.w. when all the machinery in installed. At the present time two machines are in operation, and it is expected that the remainder of the equipment will be ready for service within the next two months.

The Dominion Government, as is well known, is building the Trent Valley Canal to provide a waterway from Georgian Bay to Lake Ontario. The difference in elevation between these two points is in the neighborhood of 325 feet, thus necessitating the construction of numerous locks along the path of the canal. For a part of its length the canal follows the course of the Trent river, which drains a superficial area of approximately 4,350 square miles. The average discharge from observations extending over three years is estimated at 4,742 cubic feet per second. Dam No. 1, section No. 5, of the Trent Valley canal was built across the Trent river by the Dominion Government. The locks are located on one side of the river, while on the other the power company has built the headworks for the intake canal, which conveys the water from just above the Government dam to the generating station, located about 1,200 feet below and near the shore line.

The general layout of the headrace, the dam and station, is shown in figure 2. This sketch shows that the headworks for the intake canal are built at an angle with the main dam across the river, giving the headrace considerable curvature before it reaches the generating station. This construction was chosen in order to suit the rock contours. The intake at the headworks consists of two end and four intermediate piers of concrete, forming five stop log openings, each twenty-five feet wide and eight feet below the water line. A platform of reinforced concrete fifteen feet in width spans the tops of the piers. The stop logs are operated by winches. Provision is made for expansion and contraction of the platform by expansion joints located over the piers. The headrace retaining walls are backed with rock fill. The expansion and contraction is taken care of by expansion joints in the concrete walls. The width of the headrace is 149 feet at the intake, decreasing after a point about two thirds along its length is reached until at the power house the width is 104 feet. Racks are provided at the generating station to prevent floating materials from entering the turbine pits, and at a short distance behind these racks suitable stop logs are installed to control the water supply.

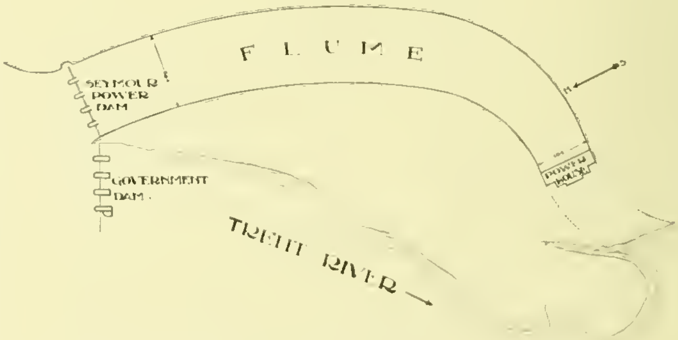


Fig 2—General Layout of Seymour Power Plant

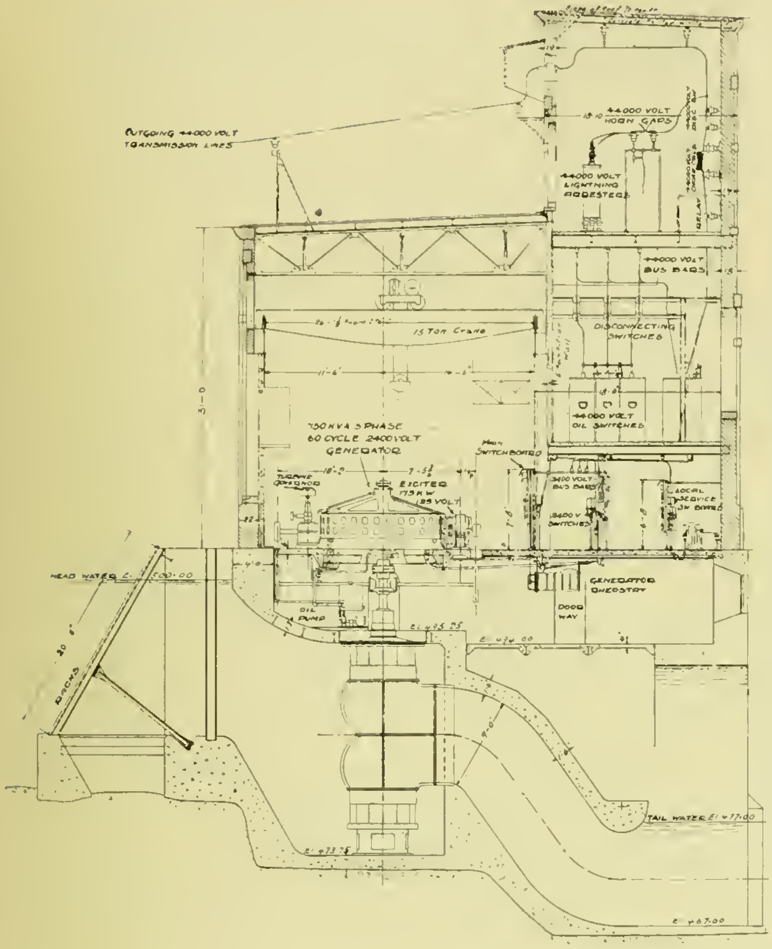


Fig 3—Cross Section of Generating Station

The Generating Station.

The generating station is shown in cross-section in Fig. 3. The substructure is composed of concrete and the superstructure of concrete block.

Generators.—The present equipment consists of two 750 k.v.a. 3 phase 60 cycle 2,400 volt 150 r.p.m. vertical type generators, manufactured by the Canadian General Electric Company. When completed the power station will contain five 750 k.v.a. generating units. All five generators are at present on order.

Turbines.—The generators are direct connected to vertical turbines of the double runner central discharge type, manufactured by Wm. Kennedy & Sons, having a maximum capacity of 1,100 h.p. under 23 feet at 150 r.p.m. The revolving parts of the two units are supported by an oil lubricated thrust bearing of the cast iron disc spherical seat type on a concrete and steel thrust deck, located between the generator and turbine.

Transformers.—The present transformer and switchboard equipment is in accordance with the generating equipment. The generating units are located in line on the up-stream side of the building, the transformers in pockets on the down-stream side, and the main switchboard between the generators and transformers. The transformers have a normal capacity of 1,125 k.v.a. and will operate 2,400 volts to 44,000 volts. They were manufactured by the Canadian Westinghouse Company, of Hamilton, Ont. The transformers are of the three phase water cooled core type, and are provided with taps for operation also at 42,000, 40,000 and 38,000 volts on the high tension side, while the low tension windings are interchangeable for 2,400 and 600 volts. Flanged wheels, Fig. 8, built into the base of each transformer, fit on rails in the concrete floor, thus allowing the units to be easily removed from the pockets for inspection or repairs.

Switchboard.—The complete switchboard, supplied by the Canadian General Electric Company, will consist of fifteen slate panels, supported on pipe frame work, including five generator panels, four transformer panels, one blank panel, two exciter panels, one motor panel and two totalling and line panels. Each panel consists of a top and bottom section, respectively 62 inches and 28 inches in length. Each generator panel is equipped with an a.c. ammeter, an indicating wattmeter, a power factor meter, d.c. field ammeter, double throw field switch, hand wheel for operating field rheostats, switch lever for operating the generator oil switch, voltmeter and synchronizer plug receptacles. The hand wheel on the generator panel is of the concentric type, so arranged as to operate both the generator field rheostat and the field rheostat of the exciter, which in the present installation is belted to the generator shaft. Each transformer panel is equipped with an a.c. ammeter with plugs for

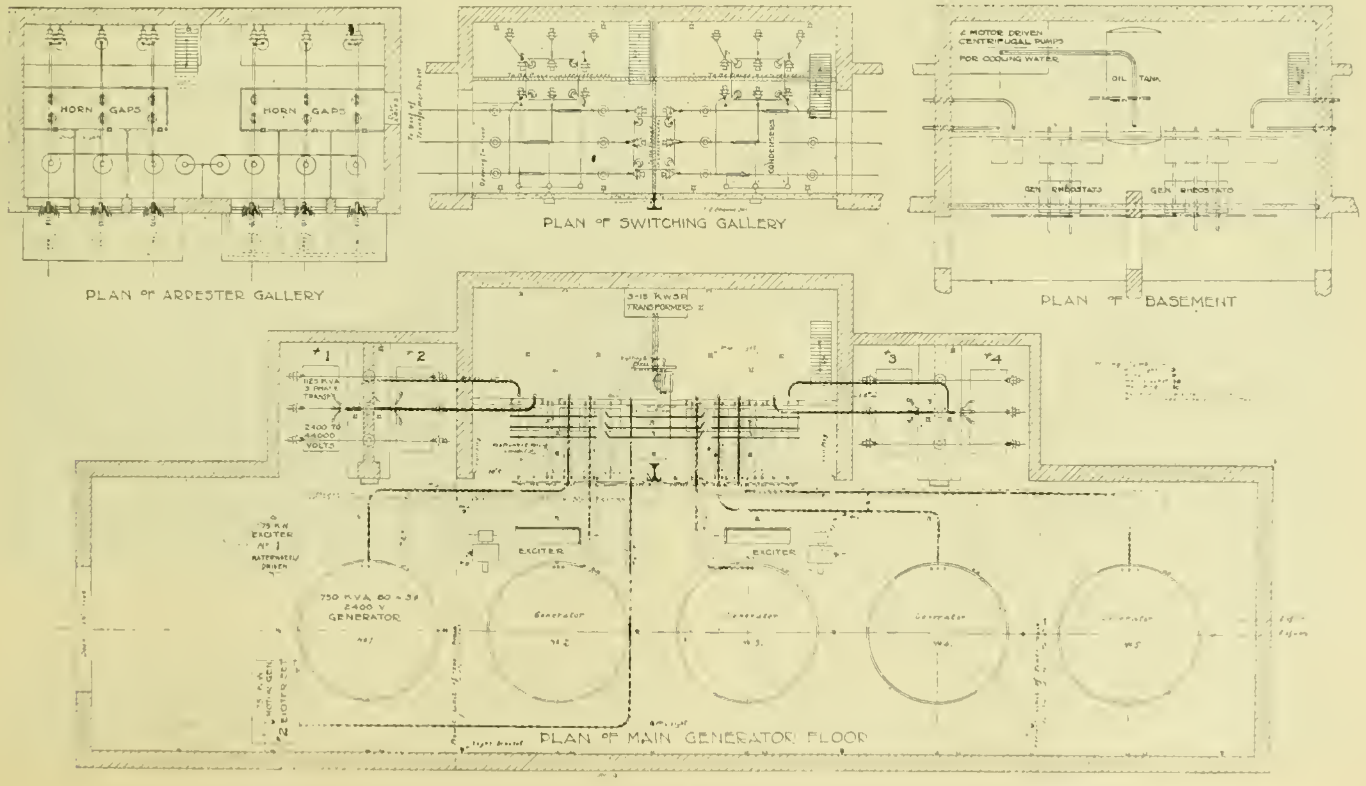


Fig 4—Horizontal Plan of Seymour Power and Electric Company's Generating Station

reading the current in all three phases, one handle for operating oil switch, mounted on the rear of the panel, and one inverse time limit overload relay for the above switch. The totalling panels are each equipped with a curve drawing voltmeter, a curve drawing polyphase wattmeter and one oil switch handle for high tension oil switch. The exciter panels contain a d.c. voltmeter, a d.c. ammeter and a d.p.s.t. 800 ampere main exciter switch. A bracket attached to one end of the switchboard supports a station voltmeter and a frequency meter, while a similar bracket attached to the other end of the board supports a bus bar voltmeter, one incoming machine voltmeter, a frequency meter and a synchronizer.

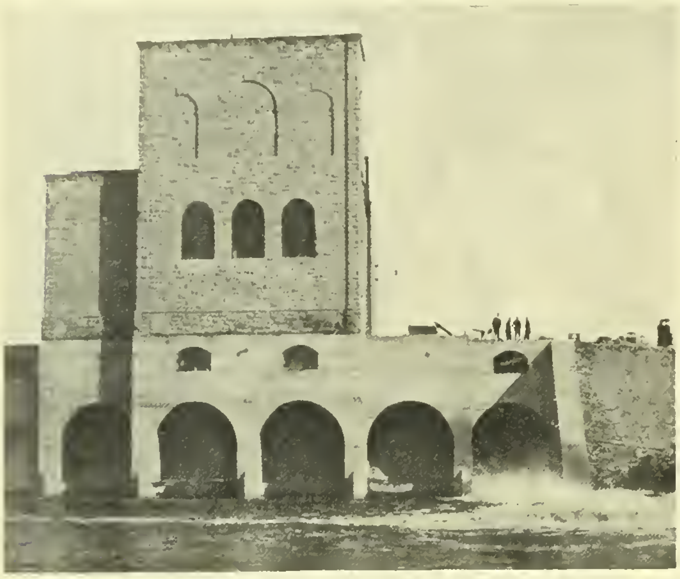


Fig 5—Generating Station, Central Section—The Powerhouse will be Extended as Required both Left and Right

Bus Bars.—The l. t. bus bars are mounted in the rear of the switchboard on insulators attached to the pipe frame work, which also supports the switchboard. They are divided by disconnecting switches into three sections, A, B and C. Two generators supply current to section A, which feeds two of the transformers. Section C is arranged the same as section A, while section B is fed by one generator and can be connected to either of the other two sections by disconnecting switches. The high tension bus bars, which are located in a compartment above the l. t. compartment, are supported on suitable insulators mounted on pipe frame work, and are divided into two sections by a non-automatic oil switch. Each section of the h.t. bus is provided with a voltage detector of the electro-static type.

Exciters.—In the present installation there are two compound wound exciters, manufactured by the Canadian General Electric Company, and rated C. Q. 15-17½-1,200, 115-125 volts. These exciters are belt-connected to the generators. There will be installed in the power house in the near future one 60 k.w. compound wound turbine-driven vertical type exciter, and one 75 k.w. exciter driven by a 2,400-volt induction motor.

Governors.—The water wheel governors were supplied as a part of the turbine equipment by William Kennedy & Sons, of Owen Sound, Ont. They were manufactured in Italy by the Riva Moneret Company.

Lighting and Power Equipment.—In the down-stream end of the building is located a lighting and power panel and, in the rear of the same, three 15 kw. 2,400/220-110 volt power transformers, which supply power for operating the crane and pumps and the lighting of the building and head works.

As shown in the section sketch of the power station, Fig. 3, the high tension oil switches are located in a compartment above the low tension bus bar compartment. Above the high tension compartment is located a second compartment, which contains the lightning arresters. These are of the aluminum cell type, manufactured by the Canadian General Electric Company. The outgoing high tension leads are supported on insulators attached to the wall and roof of the power house. The line outlets, which are provided for two outgoing lines, are of the wall type, with reinforced concrete hoods.

Auxiliaries.—Cold water is supplied to the transformers by a Watson-Stillman 2-inch ''Twinvolute' centrifugal pump, direct connected to a 2 h.p. Wagner 3-phase induction motor. A duplicate pumping unit will be installed later.

Compressed air at a pressure of about 50 pounds per square inch is used to clean the generators. A Rand, class E, compressor with cylinder 4½ x 6 inches, and having a capacity of 20 cubic feet of free air per minute, is used. It is belt-driven by a 3 h.p. motor. An air receiver is also provided.

A steel oil tank in the basement is connected by suitable piping to the transformers. It has a capacity of 1,470 gallons, that being sufficient to hold the oil in two transformers. A 4-inch piston hand pump is used to return the oil to the transformer cases after any repairs have been made.

The generator room, which is 26 feet 6 inches wide by 107 feet 4 inches long, is spanned by a 15-ton electric travelling crane supplied by The Advance Machine Works, of Walkerville.

The thrust bearings on the generator shafts are lubricated by running in an oil bath. The guide bearings are supplied with oil continuously from an elevated tank, which is kept full by an electrically-operated pump. The oil returns to the pump through a filter. The filter is a No. 15 Burt, with a capacity per day of about 500 gallons. The oil is pumped by two ½-inch rotary pumps geared to ¼-h.p. induction motor. All oil pipes and fittings are of brass.

The Transmission System·

The present transmission system, which is shown in Fig. 1, has a total length of approximately 85 miles, but new lines and extensions are under construction which will increase this distance considerably.

The Conductors.—The transmission wires are supported on wooden poles, which have a normal length of 35 feet, and are spaced 132 feet apart, but these values are altered considerably at different points in order to suit the coutonr of the country. The conductors are of stranded hard-drawn aluminum, with the exception of the wires for long spans, which are of stranded aluminum, reinforced by a steel wire core. At railway crossings the minimum size of conductor employed is number 0 aluminum. The aluminum used in the construction of the line was manufactured in Canada at Shawinigan Falls, Que., by the Northern Aluminum Company. The specifications for the cable called for a conductivity of at least 61 per cent., according to Matthiessen's standard, an ultimate strength of at least 25,000 pounds per square inch, an elastic limit of not less than 14,000 pounds

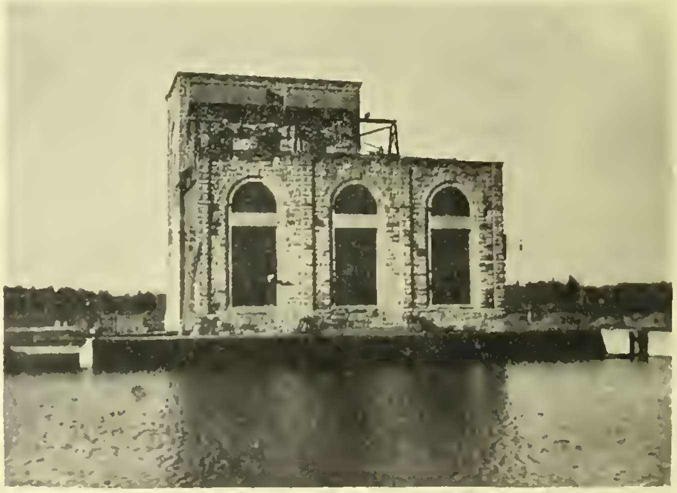


Fig 6—Generating Station Showing Intake

per square inch, and a modulus of elasticity of at least 9,000,000.

The Insulators.—The high tension line insulators are of the three piece type, No. 362, manufactured by the Locke Insulator Manufacturing Company, of Victor, N.Y. On the Deloro line they are coated with a chocolate glaze, and on the other lines with a slate-colored glaze. The insulators were cemented and tested at the factory before shipment. Each part received a dry test of 95 per cent. of its arcing over voltage, which the specifications required should not be less than three times the shell's proportion of the working voltage, or 44,000 volts. The assembled insulator was tested at 95 per cent. of its arcing over voltage, which was specified to be not less than 120,000 volts. The potential in these tests was applied for three minutes. In addition to the dry tests, the insulators were specified to stand a potential of not less than 88,000 volts for three minutes when subjected to a vertical precipitation of not less than 0.2 inches per minute and not more than 0.3 inches per minute, and which had been applied for a period of at least ten minutes. Under a similar precipitation as that given above, only directed at the insulator at an angle of 45 degrees, the insulators were specified to stand a potential test of not less than 75,000 volts for three minutes.

Insulator Attachments.—The insulators are attached to the cross arms by a special malleable iron pin designed by the consulting engineers for the power company. This pin consists of three main parts,—a bolt threaded at both ends, a bell-shaped part which fits over the bolt and rests on the cross arm, and a thimble which was cemented into the insulator at the factory. Suitable washers and nuts are also supplied for attaching the bolt to the cross arm.

The Cross Arms.—The cross arms are of long leaf yellow pine. The general cross arm construction is single armed with the exception of long spans, angles and railway crossings, where a double arm or special structure construction is employed. Head guys are provided on tangent lines every half mile, while at angles, long spans and railway crossings, special guying is provided.

Ground and Telephone Wires.—In addition to the transmission wires, the poles carry a galvanized ground wire and telephone wire. The ground wire is attached to a malleable iron support, bolted to the top of the pole. The ground wire consists of 7-strand ¼-inch galvanized steel wire, specified to stand a pull of 4,000 pounds without breaking. It is grounded every second pole by a wire stapled to the side of the pole and given a few turns about the portion which rests in the ground. At the different stations, railway crossings and at river crossings, special grounding plates of copper are used.

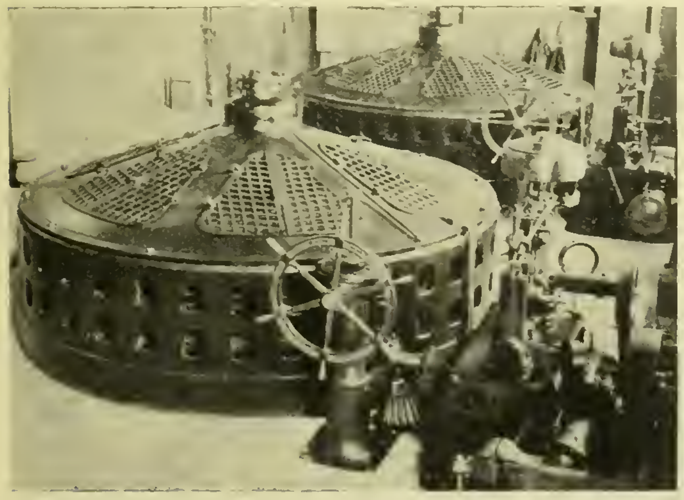


Fig 7—Seymour Power and Electric Company's Generators

Telephone System.—The telephone circuit is transposed every third pole and in addition there are occasioned transpositions of the 44,000-volt line. These combined transpositions, designed to thoroughly neutralize the inductive and electrostatic effects of the high tension current on the telephone line, have given very gratifying results inasmuch as communication between the various sub-stations and the power house is carried on, with practically the same clearness as if there were no high tension currents in the vicinity.

The Sub-Stations.

The Deloro sub-station, which is especially calculated to supply power to the Deloro Mining & Smelting Company's works some two miles east of Marmora, and about twenty-two miles from the power house, may be taken as typical. This mining company's steam plant, which consisted of two 100 kw., 600-volt, A.C.B. steam-driven, belted alternators, will now be shut down.

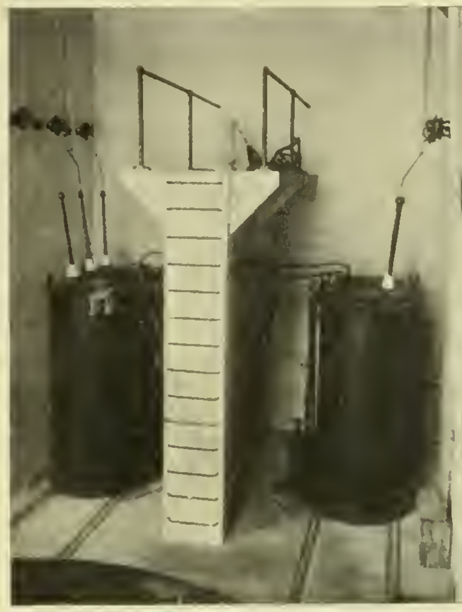


Fig 8—The Transformers run on Rails Set in the Concrete Floor

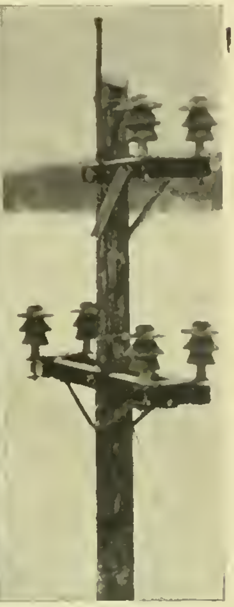


Fig 9—Special Corner Tower

The new substation main floor apparatus consists of three 250 k.v.a., single phase, oil insulated, self cooled, Westinghouse transformers, delta connected. The primaries are wound for 44,000 volts, but are also provided with taps for operation at 42,000, 40,000 or 38,000 volts; the secondaries are likewise interchangeable for 2,400 volts or 600 volts. The 600-volt winding is used in the Deloro station. Practically all the transformers throughout the system are of this interchangeable type, which uniformity will make the class of service which can be rendered more general and will make it posible, in case of emergency, to use any spare unit in any one of the substations where trouble may arise. The low tension switchboard for contracting and measuring the 600-volt power which is delivered to the mining company, is located on ths floor.

The high tension switching, wiring and lightning arrester equipment occupies the upper floor. The 44,000 3-phase line enters the building through porcelain wall insulators, protected by corrugated galvanized iron hoods. The current here enters the 3-phase, 44,000-volt oil switch. Arangements are such that the high tension side of each transformer may be disconnected separately by means of disconnecting switches, and as the transformers are delta connected on both high tension and low tension sides a defective transformer may be cut out and 3-phase power still furnished from the two remaining transformers. Electrolytic lightning arresters with horn-gap disconnecting switches are used for protection against lightning.

The basement contains the oil tank and a hand oil pump for filling the transformers with oil.

About 200 h.p. is now being delivered at this station, which amount will be greatly increased as soon as the mining company can instal the necessary machinery.

The Other Substations.—The Madoc station is providing energy for commercial, house and street lighting in the town of

Madoc, and also supplies the George H. Gillespie talc mill with from 100 to 150 h.p., and has thereby enabled this mill to greatly increase its capacity.

The Belleville substation supplies the Trenton Electric & Water Company with power and light for the city of Belleville. This substation also is at the present time supplying the town of Trenton, twelve miles farther west, with light and power, pending repairs to the Trenton Electric & Water Company's own plant at that point. For this purpose the 10,000-volt lines of the Trenton Company are being used and the current, as obtained in Belleville, is first stepped down from 44,000 to 2,300 volts, and then immediately in an adjoining building stepped up from 2,300 to 10,000 volts, transmitted to Trenton, and finally reduced from 10,000 to 2,300 volts again.

At Sulphide, within a few weeks the Nicholls Chemical Company will be operated off this system, taking from three to four hundred horsepower.

The town of Stirling have installed a 100 k.w. single-phase transformer in their substation for the purpose of supplying light to the town. This system is arranged so that it may be converted into a three-phase distribution in case power is needed.

The Northumberland Pulp Company, at Campbellford, will also be taking about 800 h.p. within a few weeks.

This installation was designed and has been constructed throughout under the supervision of the engineering firm of Smith, Kerry & Chace, Toronto.

The New Sluice Dam at Chaudiere Falls

Dam Constructed in Form of an Arc—Largest Falls on the Ottawa Supplies Power to Eight Different Companies.—Invention for Handling Stop-Logs

The Ottawa river has, above the city of Ottawa, a drainage basin of over 43,000 square miles, and a length of over 450 miles, and is capable of developing enormous quantities of hydraulic power. The largest single power on the river is located at the Chaudiere Falls, in the city of Ottawa.

Most of the leases for water power at this point were taken out about 1850. The total power at the Chaudiere is controlled by eight different companies, two located on the Quebec side and six on the Ontario side, and is mostly held under Crown grants issued by the government of Canada prior to the days of confederation.

In the early days, and, in fact, up to the time of the big fire of 1900, when most of the power was used for sawing lumber, the low water combined with frazil in the winter season caused little inconvenience on account of the mills being shut down during that period of the year. After the fire, however, a large proportion of the power was utilized for the generation of electrical energy and in other industries requiring a steady flow of water the year round, and, consequently in the winter, the plants were badly handicapped and at times forced to shut down temporarily, because of the low water and the pressure of large masses of frazil, which formed in the Remoux and Little Chaudiere rapids, located immediately above the Great Chaudiere Falls. This shortage of power gave rise to considerable competition between the power users individually, and between the Ontario and Quebec parties collectively, each side claiming that the other was using more of the water than it was entitled to, until finally necessary improvements were often blocked by injunctions lest the improvement should mean in some way greater consumption of water.

This state of affairs lasted some years and gave rise to several lawsuits, which threatened, after great delay and expense, to reach the Privy Council. Wiser counsels prevailed, however, and the various interests represented, in order to avoid both the law costs and the loss of time which must have resulted, began negotiations, and after an alternate exchange of views covering several years, an agreement satisfactory to all parties was adopted and executed on December 27th, 1907.

One thing which contributed very largely to the settlement of the difficulty was the desire on the part of all the hydraulic lessees, because of increasing values, to develop to the maximum capacity their water powers, by the building of a new dam at the Chaudiere, and also by regulating the flow of water in the river under a system of storage dams that would hold back the surplus water of the spring freshets, and allow it to escape during the low water season.

The importance of these storage dams was laid before the government with a request for assitance and it was finally arranged that the Dominion Government should undertake to construct the required storage dams if the power companies would combine and build the new dam at the Chaudiere Falls. The points at which the Government dams will probably be built are

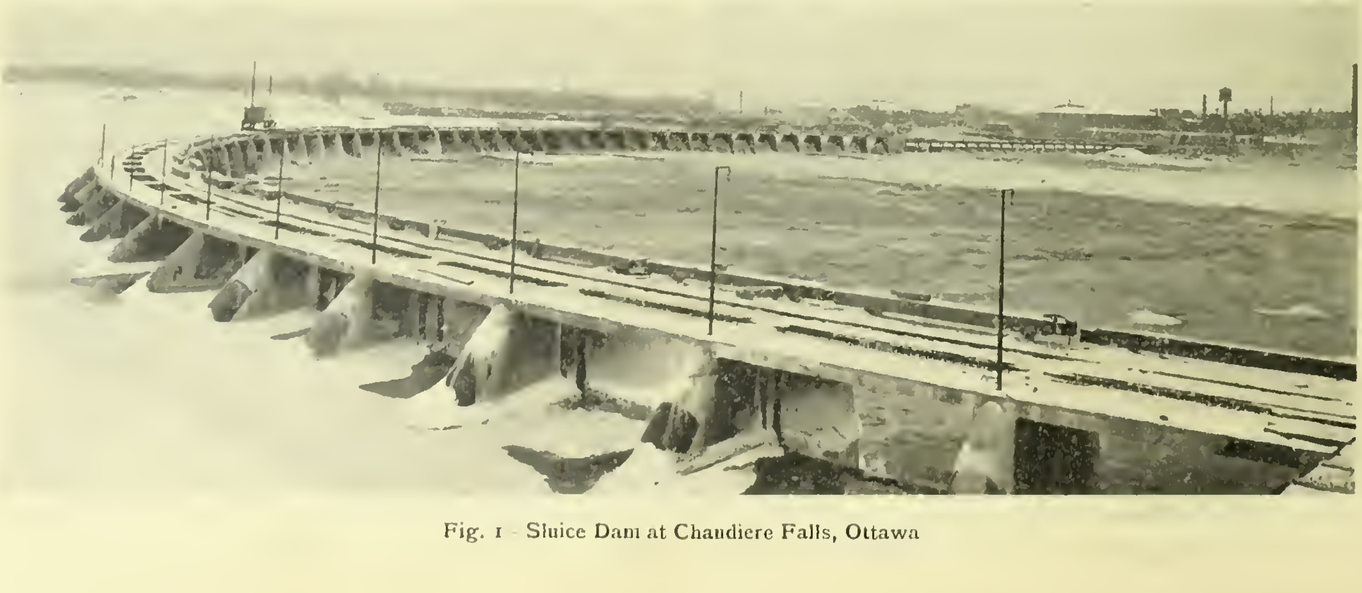


Fig. 1 - Sluice Dam at Chaudiere Falls, Ottawa

near Lake Temiskaming, Lake Kippewa, Lake Quinze and Lonely river, and at other points if required. The Government dam at Lake Temiskaming is now under construction and the Chandiere dam already built by the power companies is shown in Fig. 1. By the agreement the dam at Chaudiere is so constructed that half of the water may be utilized from each side of the Ottawa river.

The engineers who had the construction of the power dam in charge were Wm. Kennedy, Jr., Montreal, for the Quebec power owners, and John B. McRae, Ottawa, for the Ontario companies. This sluice dam consists of 49 piers, with abutments at each end, as shown in Fig. 1. By the use of some 500 stop-logs, a tight dam is obtained, and by either putting in stop-logs or taking them out, the elevation of water surface is perfectly controlled.

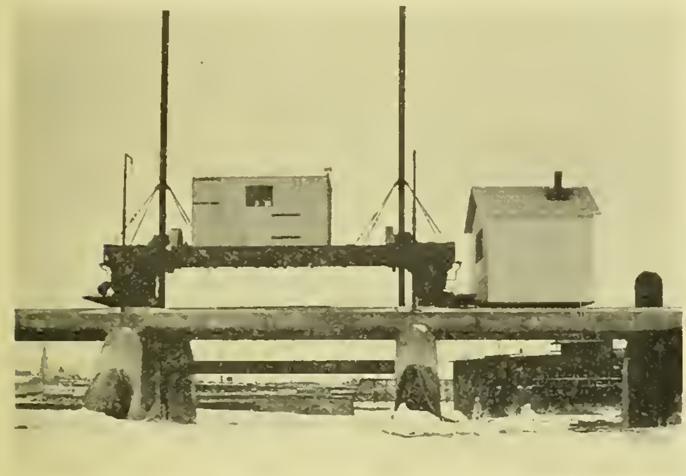


Fig. 2—Winch in Operation, Stop-Log Being Raised

A few figures on this work, which will be of interest, follow: It is built as an arc of a circle, the piers being radial; the length of the arc is 1,304.7 feet; the length of the radius from centre of arc to pier is 568.33 feet; the length of the piers is 39 feet 5 inches; the piers are 4 feet wide at the head and 2 feet wide at the tail; the depth of a pier from sill to top of bridge is 22 feet; the elevation of the sill is 37 feet, and of the bridge floor, 59 feet; the width of each of the 50 openings is 22 feet at checks.

Handling the Stop-Logs.

Figures 2, 3 and 4 illustrate an ingenious and valuable invention for handling stop-logs for power houses or sluice dams. This winch was designed by Mr. William Kennedy, Jr., of Montreal, and constructed by the Victoria Foundry, Ottawa. This type of winch has been used with great success in handling the 500 stop-logs used in the Great Chaudiere Dam. Each single log weighs 3,000 pounds, and the double logs weigh some 6,000 pounds.

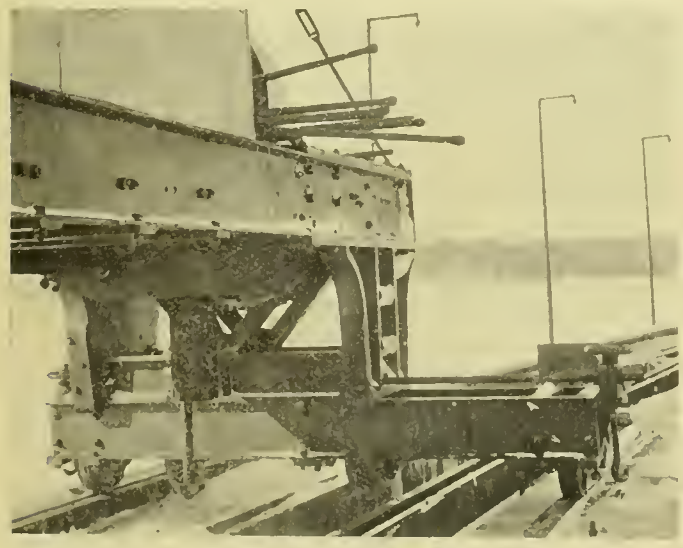


Fig. 3—Winch has 32 inch Side Travel on Trucks

The stop-log winch, the machine handling these massive logs consists essentially of two long powerful rams or arms, mounted with suitable driving gears and shafts, on a heavy steel frame supported by two trucks. At the end of each ram is a hook which can be fitted and secured in the recesses at the end of the stop-log. Opposite each stop-log post, are two heavy anchors firmly secured in the concrete structure. To these the frame of the winch is secured by hooks. This anchorage enables the rams not only to lift the stop-logs, but also to force them down in the checks and ensure a tight fit between logs, thus saving leakage. Clutches enable the rams to be operated singlyor together. A side travel of 32 inches is provided on the trucks, to enable the machine to serve both stop-log checks. The maximum lift the winch is designed to exert, equals 35 tons; the maximum speed for rack on rams, motor-driven, is 29.6 feet per minute; the rack on rams travels per revolution of crank shaft, 0.285 inches; maximum speed of winch on rails is 189 feet per minute; winch travels on rails 0.97 feet per revolution of crank. All gears are made of cast steel with dressed teeth. Rack is made of cast steel and rough teeth. Rack pinion is made of forged steel and teeth are dressed.

The power necessary for operation is supplied by a 50 h.p., d.c. motor operated at 600 volts. If this fails, hand power may be used with the handicap of slower handling of the logs. The motor is provided with a street railway controller. The cabin on top protects the operator of the motor, clutches and brake. There is a bell in it with a cord outside to enable the men handling the stop-logs to signal the operator of the winch.

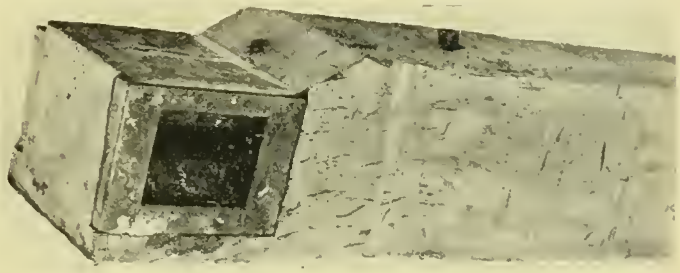


Fig. 4—Showing Recess, for Hook, on 3000 pound Log

A separate truck is attached to the winch, a house protecting a 5 h.p. boiler. This boiler is used to thaw out the checks and recess in stop-log for ram-hook. The ice sheet of the river is kept clear of the logs by keeping a foot width chopped clear upstream of the logs.

With this outfit no difficulty has been found in handling the logs in the severest zero weather. To further facilitate the handling of the logs two crane beams with trolley, blocks and tackle will be added to the downstream side of the winch. They will enable the stop-logs being readily placed on the skids.

Ottawa Notes

The Ottawa Electric Company have at present installed two water wheels and two generators in their new power house and will soon be ready for operation.

The Ottawa Electric Company, which concern lately amalgamated with the Ottawa Gas Company, are installing a new gas holder of 150,000 cubic feet capacity.

The explosion of the Hull Dynamite Works, which resulted in the death of nine, and injuries to some twenty others, was the cause of the interruption and wrecking of the Hull and Ottawa Electric Company's 10,000-volt line, which supplies power to the Canadian Portland Cement Company, at Wrightville.

Montreal, Quebec and Eastern Canada

Comprehensive Review of Eastern Progress—No Opposition for Quebec Merger—Sixty Ton Crane for Western Canada Power Co.—Electrical Supply Business very Brisk

Saraguay Electric Company's Progress.

During the past few months the Saraguay Electric Company have been gradually increasing their field of operation. Contracts were closed recently with Notre Dame de Grace for the lighting of that town with 360 arc lamps of the magnetite type. A short time since orders were also received from the municipalities of Bordeaux and Ahuntsic, which called for the installation and operation of 50 arc lamps of a similar style.

The Saraguay Company's plant at Back River, has now a capacity of 750 k.w. and a large extension is contemplated which may be carried out at an early date. They have also secured an exclusive lighting and power franchise from the municipality of Tetreauville, and to supply this and their Point Aux Trembles load, a small temporary steam plant has been installed.

The company are gradually extending their lines into the City of Montreal, and now have ten miles constructed. This line extends through Maisonneuve to the Moreau Street Station on St. Catherine street.

The annual meeting of the Saraguay Company was held about the first of May. The financial statement presented showed a handsome surplus after due allowance was made for the payment of bonds, sinking funds, etc. Mr. Charles Brandeis, of Montreal, is consulting engineer for the company.

One Power Franchise only for Quebec City.

The Private Bills Committee of the Quebec Legislature have refused to grant operating franchises in the City of Quebec to the Dorchester Electric Company, the Champlain Electric Company and the Canadian Gas Company.

The Soulanges Power Company were granted a charter, which includes the sale of electric current and erection of transmission lines in the City of Montreal, making the ninth power company to date with operating privileges in that city.

The Montreal Light, Heat & Power Company's amendment to enforce all new companies to present their transmission line plans to the Public Utilities Commission, in order to prevent disputes between rival companies, on congested streets, was thrown out by the committee.

Electrical Association, Province of Quebec.

The monthly meeting of the Electrical Association, Province of Quebec, was held Thursday, May 12th, in Crescent Hall.

It was decided to send President M. Rubenstein and Treasurer W. B. Shaw, as the Association's delegates to the Convention of the National Electrical Contractors' Association, which is to be held this year in Atlantic City, July, 20th, 21st and 22nd.

Mr. Clarence Thomson was elected the second vice-president of the Association in place of Mr. C. J. Young, who has severed his connection with the electrical business. Mr. Thomson was also made president of the entertainment committee. Mr. F. J. Parsons, manager for Messrs. McDonald & Willson, and Mr. W. Rochon were also elected to fill vacancies in the executive board, caused by the resignation of Mr. J. M. Walkley, and through Mr. Thomson's election to second vice-presidency.

New Asbestos Company for Quebec District.

The Belmina Consolidated Asbestos Company, Limited, have under construction at Coleraine, Que., a new plant for the manufacture of asbestos and will, it is expected, use current from the Shawinigan Water & Power Company to operate their mill. Coleraine is located in the asbestos district of Quebec, not far from Black Lake, and the Shawinigan Company have at present a non-equipped pole line to Belmina, quite close to the site of the new asbestos mill.

The General Electric & Manufacturing Company, of Sweden, have secured through their Montreal sales office, the contract for the electrical installation, to consist of two 300 h.p., two 75 h.p., two 10 h.p., slow speed, 2,300-volt, 30-cycle motors and transformer equipment.

Mr. Rodolphe Forget is one of a number of Montreal capitalists interested in this new asbestos plant.

Lombard Governors in Demand.

The following Canadian installations of Lombard governors have been recently arranged for by the Lombard Governor Company's representative, Mr. Roswell P. Smith,—Simcoe Railway & Power Company, three Q-10; Quebec Railway, Light & Power units; Ottawa Railway Company, one N-14; Sherbrooke Railway & Power Company, there Q-10; Quebec Railway, Light & Power Company, four, N; Calgary Power & Transmission Company, one N-14; Vancouver Island Power Company, one Q-7½; Daly Reduction Company of British Columbia, one type R; town of Renfrew, Ontario, one Q-6; town of Campbellford, Ontario, one N-10.

Supply Conditions.

Local firms report a continuance of the excellent spring demand for the various classes of electrical supplies. Montreal wire manufacturers have their plants working to full capacity and in several instances night shifts are employed.

Business in the smaller electrical supplies is very brisk. Messrs. Dawson & Company report a most encouraging outlook, their Canadian business generally being excellent.

Contractors are finding it difficult to secure porcelain goods and these must be paid for at the recent American advance of 100 per cent. In some quarters it is anticipated that an inrush of German porcelains may be expected shortly which will be offered at materially decreased prices.

Regulations of Electric Signs.

Notice of motion has been given by the city council that a by-law will be introduced giving the city surveyor power to control all electric signs in the city. A section of the by-law is as follows: The city surveyor may recommend that permits to hang or attach electric signs to buildings, at right angles, or to maintain the same, if they have been erected previous to the adoption of this by-law, be issued by the city treasurer under the by-law concerning assessments, taxes and licenses, provided the said signs do not project more than six feet from said buildings, over the public sidewalk, that they do not exceed the width of said sidewalk, if the same is less than six feet wide, and that they be placed at a height of at least ten feet over said sidewalk.

Dawson-Thornlow Nuptials.

The marriage of Mr. J. A. Dawson, of Messrs. Dawson & Company, to Miss Evelyn Thornlow, niece of Bishop Thornlow of the Toronto Diocese, was very quietly celebrated in Montreal on May 19th. The ceremony was performed by the bride's uncle, the couple leaving immediately afterwards on an extended wedding trip.

There is no more popular man in the ranks of the Montreal electrical fraternity than Mr. "Joe" Dawson, and it is assured that he will be made the recipient of warmest congratulations on his return, in having secured a most charming bride.

A few of Mr. Dawson's more intimate friends, learning of the approach of the happy event gathered at the Corona Hotel, May 17th, and in a jolly little banquet fittingly honored the occasion of Mr. Dawson's transfer to the rank of the benedicts. During the proceedings the guest of the evening was remembered with a tremendous bunch of American Beauty roses. Those present were Messrs. H. L. Mallison, secretary of the Canadian Light & Power Company, and Mr. W. A. McNaught; R. N. Hannaford, A. S. Bird and Harry E. Smith, of the Montreal Street Railway Company; F. W. Miller, Canadian General Electric Company; J. D. Evans, J. G. White Company, New York; B. Reynolds, Eugene F. Phillips Company, and Bert Colson, F. N. Finlay, F. C. Nichol, G. Rice, W. A. Cooke, Walter C. Hagar, L. R. Cooper, A. C. Jack, W. Harold Reynolds, Bob. Foster, P. Dawson and H. A. Whitby.

An Interesting Swedish Plant.

Mr. H. D. Bayne has just returned from a most enjoyable trip to Westeras, Sweden, where the head offices of the General Electric Manufacturing Company of Sweden are located. Among other interetsing trips made, Mr. Bayne visited the Swedish government plant at Trollhattan and witnessed the starting up of the first of the 12,500 h.p. units which will be installed in this large power station by the General Electric Company of Sweden. The plant possesses many interesting features. All existing power charters and water rights were first expropriated by the state before this development was undertaken. The power house is situated on the Gota river, between Lake Vanern and the sea, and it is estimated that 200,000 h.p. is available for further development. Ultimately eight of these large 12,500 h.p. units will be installed at Trollhatton, and power will be supplied to Gottenburg and surrounding districts. The transmission will be 25 cycles at 50,000 volts, the highest voltage yet employed in Europe. The generators, which are 11,000 kilovolt amperes capacity, are also the largest generators yet built in Europe. The transformers employed are of the single-phase oil-insulated, water-cooled type. The turbines are of the double Francis type, normal output 10,000 h.p. and maximum capacity 12,500 h.p. for a minimum head of 100 feet at 187.5 r.p.m. They are being built at the Jens Orten-Boving Company's works in Kristinehamn.

Quebec Hydraulic Commission.

The Quebec Legislature have decided to enlarge the scope of the hydraulic commission, which will shortly be appointed to investigate conditions and to submit rules for the management of all running water, docks, dams, etc., in the Province of Quebec. The commission will probably consist of two hydraulic and one forestry expert and will likely be permanently appointed.

McGill University Notes.

Prof. L. A. Herdt visited Winnipeg recently in connection with the interests of that city's big power development.

About ten members of the electrical graduating class were able to make the trip of inspection through Ontario, under the auspices of the McGill Electrical Club. The party left Montreal on April 3rd, and were accompanied by Prof. Herdt. They spent an interesting day at Niagara Falls, covering the various generating stations of the large development company, while Hamilton and Toronto electrical stations were also thoroughly studied by the students. The party returned to Montreal May 5th, after an exceedingly pleasant and instructive tour.

Mr. F. Silver, an undergraduate in the Faculty of Science, McGill University, was instantly killed in the Garson Mines, Sudbury, Ont., by coming in contact with a live wire.

Mr. Jos. W. Hayward, M.Sc., late Assistant Professor, Mechanical Engineering, McGill University, has opened a consulting office at 703 Power Building.

Current News and Notes.

The order, the Board of Railway Commissioners is issuing from Ottawa, requiring all street railways under its jurisdiction to equip their large cars with air brakes, does not apply to the Montreal Street Railway Company, since all their double-truck cars are now equipped with air-operated brakes.

An action has been brought against the Asbestos and Asbestic Company, Asbestos, Quebec, by Mrs. Collard, to recover $15,000 on account of the death of her husband while in this company's employ.

The Western Canada Power Company, through their purchasing agents, the Montreal Engineering Company, have just contracted with the Canada Foundry Company, Toronto, Ont., for a sixty-ton electrically operated crane for installation in their Ruskin, B.C., power house. The contract for their requirements of high tension insulators has also been awarded to the Ohio Brass Company.

The Foundation Company, Limited, New York and Chicago, have opened a Canadian office at 76 Bank of Ottawa Building, Montreal, with Mr. Alexander Allaire, the engineer in charge. This company make a specialty of constructing bridge piers, dams, water power constructions, power plants, sea walls, wharves, quays, tunnels, lighthouse and heavy building foundation construction, and pneumatic work of all kinds.

The Allis-Chalmers-Bullock, Limited, are now in their new down-town sales offices, in the Canadian Express Building, Montreal, where they have much larger space than in their former quarters.

The Vickerson Electric Company are now occupying new and larger premises at 23 St. George street.

Following the announcement that the Fire Underwriters have decided to establish a branch of their electrical inspection bureau in that town, it is interesting to note that the municipal authorities have issued insructions to have all overhead elecrical construction brought up to the standard specified by the Canadian Fire Underwriters. There are two power companies in Grand Mere, one a non-operative concern, owing to a writ of injunction which has been issued against them, and the Phoenix Syndicate, at present supplying all the lighting and power requirements.

The Marconi Company are now accepting messages for transmission via their land lines and wireless systems between Montreal and any point in Great Britain and Ireland. The rates charged for messages are: commercial, in code, fifteen cents a word; press messages, seven cents a word; ordinary messages, twelve cents a word. These rates are based on a minimum of ten words per message. The present cable rates are twenty-five cents per word.

The D. P. Storage Battery Company, of London, England, have received through their Canadian representatives, Messrs. W. J. O'Leary & Company, an order for the installation of a 320 ampere hour, 220-volt storage battery for a New Bedford, Mass., firm. The fact that its order was taken subject to a heavy import duty and is to replace an existing battery, speaks very highly of this firm's apparatus.

The Ottawa & Montreal Power Transmission Company have been granted a Dominion operating charter. The company is composed of Ottawa capitalists, owning four water powers on the north shore of the Ottawa river.

The Montreal Electric Company are preparing to extend their present business. The company recently secured a Dominion charter with an authorized capital of $40,000, and Messrs. E. J. Gunn and F. A. Newbury, for some time in the employ of the company, have been taken in as members. It is the intention to deal more extensively in supplies for interior wiring. Mr. W. B. Shaw is the president of the newly-organized company.

The Dominion Light, Heat & Power Company have fixed their lighting rates for the city of Montreal, on five-year contracts, at 15 cents per kilowatt, less 50 per cent. discount, with different rates depending on local conditions. The company expect to deliver current in the city shortly.

The Jenckins Brass Manufacturing Company, 35 Fleury street, Montreal, have gone into liquidation. The liabilities of the company are placed at $23,892, with assets of $28,000. The banks are fully secured to the extent of $9,700. $9,968 is due to one of the directors of the company, and there are accounts payable up to $9,223. The statement of assets do not include $4,000 due the company for outstanding accounts. Mr. A. C. Jenckins was managing director, and the company were manufacturers of brass goods and electric fixtures, etc., and were also general wiring contractors.

The directors of the Shawinigan Water & Power Company and of the Montreal Light, Heat & Power Company recently made a short trip to the main generating station of the former company at Shawinigan Falls.

The Sayer Electric Company and the Canadian Fairbanks Company were among the Montreal business houses which fittingly decorated their premises in honor of His Late Majesty King Edward VII.

Tenders have been asked for the installation of two 50-light magnetite arc equipments together with 100 arc lamps, for the Verdun Power Company. It is expected that this work will be completed during the present summer. Mr. Chas. Brandeis is the municipality's consulting engineer.

The Canadian Westinghouse Company, Limited, are in their new premises in the Victoria Building, 52 Victoria Square. They are occupying the whole of the ground floor with their offices, while the basement is used as a storage department.

Messrs. Chapman & Walker, Limited, engineers and contractors, Toronto, have recently opened a Montreal branch at 429 Coristine Building.

Personals.

Mr. Fred. Thomson, of Messrs. Fred. Thomson & Company, has returned from a very pleasant trip to Macklem, Sask.

Mr. J. M. Robertson has returned from a trip to the plant of the Mines Power Company, Limited, Cobalt, Ont.

Mr. Kenneth Drinkwater, formerly connected with the electrical department of the Canadian Fairbanks Company, Limited, has joined the staff of the Ford Iron & Machinery Company, Canadian Express Building.

Mr. R. T. MacKeen, manager, electrical department of Canadian Fairbanks Company, Limited, was in Charlottetown, P.E.I., for several days during the present month.

Mr. R. A. Stinson, vice-president of the Canadian Crocker-Wheeler Company, is now located at the firm's headquarters in St. Catharines, and Mr. E. T. Mug is now in charge of the Montreal office. Mr. Stinson will be greatly missed by a host of Montreal friends, and kindest wishes follow him to the Ontario city.

Mr. Paul Gauthier, resident director of the Mexican Northern Power Company, attended the annual meeting of this company held in Montreal recently. Mr. Gauthier states that from present indications they will find a ready sale for their development of 10,000 horse power at the rate of fully one hundred dollars per unit.

Mr. M. Rubenstein has the contract for the electrical installation in the new Waldman apartment house.

Mr. R. M. Wilson, chief engineer of the Montreal Light, Heat & Power Company, spent two weeks in northern Quebec, with the "Club Chapleau," during the latter part of May, in search of the wily trout. An excellent coating of tan attests a vacation well spent.

Mr. Watson Jack, of Messrs. Watson Jack & Company, engineers, Power Building, is at present on an extended European trip.

Mr. Douglas McCurdy, of Baddeck, N.S., was in Montreal for a few days recently. Mr. McCurdy is a graduate of the School of Science, Toronto University, and has achieved considerable fame in aviation circles, Prof. Graham Bell having stated that he knows more about aviation matters than any other living man. According to Mr. McCurdy the operation of aeroplanes by electricity is not far distant, the question of weight being the difficulty at present.

Mr. R. S. Kelsch and staff are now located at 701-702 Power Building. The new offices are much more extensive than the former ones and are quite handsomely finished.

Mr. C. L. Reizenstein, representing Messrs. Robbins & Myers, manufacturers of electric motors and fans, New York, was in Montreal during the month.

Mr. Kuhn, secretary-treasurer, American Electric Heater Company, paid a visit to Monteral recently.

Mr. Roswell P. Smith, Canadian representative of the Lombard Governor Company, Ashland, Mass., was in Montreal recently.

Mr. Pashley, representative of William R. Noe & Sons, New York, electrical shade and glassware manufacturers, made a recent visit to Montreal.

Mr. W. A. Beddoe, newly-apopinted Canadian Trade Commissioner to New Zealand, was in Montreal for a few days recently. Mr. Beddoe will undoubtedly have from time to time, valuable information for the Canadian electrical manufacturers concerning the business opportunities which New Zealand affords. He will be located at Aukland, New Zealand.

Mr. R. S. Kelsch, consulting engineer, has returned from a business trip to Baltimore and New York.

Mr. R. Edwards, Jr., of the Northern Electric Company, is in San Francisco.

Recent Book Reviews

Dynamo Building for Amateurs, or How to Construct a Fifty-two Watt Dynamo, by Arthur J. Weed; Norman W. Henley Company, New York, publishers; price, cloth, $1.00; paper, 50 cents. A practical treatise showing in detail the construction of a small dynamo or motor, the entire machine work of which can be done on a small foot lathe. Dimensioned working drawings are given for each piece of machine work, and each operation is clearly described. Many of the illustrations are from photographs of the work actually under way.

Handbook for Steam Engineers and Electricians.—By Calvin F. Swingle, C.E., Frederic J. Drake & Company, Chicago, publishers; price, $3.00. An entirely new edition, but along the same line as the original issue of 1903, and contains over fifteen-hundred pages of practical, non-technical information. A comprehensive series of every-day questions, with, for the most part, very clearly expressed answers is an important feature.

A History of the Logarithmic Slide Rule and Allied Instruments.—By Florian Cajori, Ph.D., Engineering News Publishing Company, New York. Price, $1.00. The writer states that gross inaccuracies occur even in standard publications with regard to the history of the slide rule and this publication purports to be an authoritative review of the development of this labor-saving device from the year 1614, when logarithms were invented by John Napier, up to the present day. A "Bibliography of the Slide Rule" is appended, where the reader will find the names of the principal books that have been written about this instrumnt from 1620 to 1909..

British Columbia and Western Provinces

C. P. R. to Electrify Mountain Lines—Contracts Awarded in Vancouver's Lighting System—Cable to Connect Nanaimo and Vancouver

Ornamental Lights for Vancouver Streets.

All details have at last been completed in connection with the installation of ornamental street lighting systems in Vancouver, a reference to which appeared in our last issue accompanying a cut of the standard to be used. The new lights will be installed on Hastings street, from Burrard to Gore avenue; on Cordova street, from Granville to Carrall; on Georgia street, from Granville street to Coal Harbor bridge, leading to Stanley Park; and on Wstminster avenue, from Powell street to the bascule bridge. The city council has accepted the responsibility for the up-keep and supply of electric current for these systems, the property owners paying the first cost of installation. To the firm of A. E. Earle & Company, manufacturers' agents, Pender street, belongs the credit of having initialed the work and carried it to a successful conclusion by securing the support of the individual property owners.

As the Hinton Electric Company's tender was the lowest by $6,409, the contract was awarded to that firm. Messrs. Earle & Company's price for the lamp standards was $6.25 per standard lower than the next bid, hence the contract went to them. On the above tenders, the installation, ready for service, will cost the property owners as follows: Hastings street, $2.65 per front foot; Westminster avenue, $2.80; Georgia street, $2.10, and Cordova street, $2.45. The difference in these amounts is largely due to the fact that on Hastings street, in accordance with City Electrician McCrossan's plan, the standards will be an average distance of 97 feet apart; on Westminster avenue, 89 feet; on Cordova street, 120 feet, and on Georgia street, 134 feet. They will be installed along the curb on each side of the streets mentioned, and there will be one on each corner at all street intersections.

City Electrician McCrossan's specifications call for a very efficient and economical (as regards maintenance) installation, with a view to benefitting by the mistakes made by other cities. The conduits must all be of Sheranduct steel and covered with a two-inch plank, or of two-inch hydraulic pressed fibre ducts laid in a three-inch bed of concrete. All service and main conduit wires are to be on the three-wire system, lead encased cable with sheathing not less than 3-32 of an inch in thickness. The concrete bases for the standards must be 21 inches deep by 24 inches square, with three-quarter inch bolts, 24 inches long, embedded, to which the standards are to be firmly fastened. Each standard is to be equipped with five 75-watt Tungsten lamps, one 16-inch and four 12-inch spherically-shaped globes, and in the base of each standard will be a transformer which will reduce the voltage to 11.3 volts. This low voltage will serve to prevent breakage of lamps from vibration caused from passing vehicles and tram cars. Altogether, the specification calls for a strictly first-class installation, and the entire work is to be subject to the approval of the city electrician and city engineer.

With this system installed Vancouver will undoubtedly rank among the best lighted cities of the world.

A Network of Electric Lines.

With the completion of the Fraser River Valley branch of the British Columbia Electric Railway to Chilliwack at the end of the present year, and other contemplated extensions, the company will have a network of electric lines in this part of the province totalling 150 miles. Twelve years ago the present company took over and consolidated the separate systems then in existence, and since then development work has been actively pushed. Last year the company's cars carried 21,000,000 passengers, and this year's total, it is estimated, will be between 25,000,000 and 30,000,000. The company's railway and power systems already represent an investment of $12,000,000, and this total will be increased by $6,000,000 when present extensions are carried out. Plans are now being prepared to expend further large amounts in the development of the company's power supply. In 1904, the Lake Buntzen power plant was installed, with two units of 3,000 h.p. each. Since then two additional 3,000 h.p. units and one 10,500 h.p. unit, have been added, and it is now proposed to increase this equipment by adding another unit of 10,500 h.p. The work of enlarging the tunnel between Lakes Buntzen and Coquitlam to twice its present capacity is being pushed steadily, while the dam at Lake Coquitlam is to be raised to a height of 85 feet in order to give a much larger storage capacity and a larger percentage of reserve power. At the present time the B. C. E. R. has 1,200 men on its pay-roll.

To Electrify C. P. R. Mountain Lines.

It is currently reported that the C. P. R. management is at the back of the International Electric Company, of Nelson, B.C., recently capitalized at $1,000,000, with $400,000 fully paid up, to develop power from the Pend d'Orielle river at the point of junction with the Salmon river, the company proposing to use 4,000 cubic feet per second. The water power is probably the second largest in the upper country, the possible head being 53 feet, and there is scarcely any limit placed upon the capacity. For three or four years there have been reports that the C.P.R. was going to electrify the Crow's Nest Pass line, using for the purpose current from the above falls, and the recent statement of President Shaughnessy that the issue of $50,000,000 of new stock was to cover the cost of electrification of certain lines lends color to the Pend d'Orielle rumor. The C. P. R. was believed recently to have prompted certain offers to the West Kootenay Power Company for the sale of its franchise and plant at Bonnington Falls, the supposed object being to supply power to the main line in the near future.

Electrical Operation of Sawmills.

Considerable interest is now being manifested by electrical engineers in connection with the electrical operation of saw mills. For some years past progress has been made in this line of electrical development, and various portions of the saw mill, which had previously been driven by steam, have been put on electric drive, but the honor falls to Allis-Chalmers-Bullock, Limited, for the installation of the first complete all-electric-driven saw mill in Canada. This mill is being built by John Hanbury, esq., of Vancouver, and is situated on False Creek. The mill will have a capacity of 100,000 feet per day, and everything will be driven by electric motors. The order for this entire equipment was recently placed with the Vancouver office of Allis-Chalmers-Bullock, Limited, and includes a 500 k.w. turbo-generator set and some thirty-five induction motors, ranging in power from 15 h.p. to 300 h.p. 440-volt, 3-phase, 60-cycle current will be used throughout the mill. The boiler plant will, of course, be operated by the slabs and sawdust from the mill, and it is expected that power will be turned out for something less than $25.00 per horse power per year.

Electrical Machinery for Reduction Company.

Extensive improvements are now being made by the Daly Reduction Company in their reduction plant at Hedley, B.C. A considerable amount of new electrical machinery is being installed and they have just placed an order with the Vancouver office of the John McDougall Caledonian Iron Works Company, Limited, for a 600 h.p. Doble Impulse water wheel, with special needle nozzle and auxiliary relief. This wheel is to be direct connected to a 350 k.w. generator, and is to supply power both for the mines and the reduction works.

Bedding Company Installs A.C.B. Generators.

The B. C. Bedding & Upholstery Company, of Vancouver, have recently entirely remodelled their manufacturing plant on False Creek, and have installed electric power throughout. They recently placed an order with Allis-Chalmers-Bullock, Limited, for the following three-phase 60-cycle, 2,200-volt induction motors, for the operation of their various machines: Two 30 h.p. motors; one 50 h.p. motor, and one 75 h.p. motor.

Electrical Notes.

The Western Canada Power Company, which is developing 80,000 horse power at Stave River Falls, some forty miles northeast of Vancouver, for transmission to Vancouver and other points in the district, is already utilizing a portion of the power of the west branch of the stream for the operation of a small unit, the current from which will be utilized on construction work at the power house and for the operation of a light electric railway eight miles in length, which the company will at once proceed to build between Stave Falls and Ruskin station, on the main line of the C.P.R., in order that it may be completed in time to handle the heavy hydro-electric machinery which will be ready for delivery and installation in September or October. The plant is expected to be completed early next year.

City Waterworks Superintendent Madison has again entered a complaint concerning the leaking of electricity from the rails of the tram line. A number of services have had to be replaced owing to the injury from this cause, and following an examination by City Electrician McCrossan and Superintendent Madison, the latter says he is satisfied many additional services would be eaten out by the current within three months.

A company in which Vancouver capital is largely represented is being formed for the purpose of establishing a large electric lighting and power plant in the upper Okanagan valley. The principal aim of the new company will be the construction and operation of lines of electric railway which will radiate from the town of Vernon.

The Kootenay Telephone Lines, Limited, with head offices at Cranbrook, B.C., have much new work under way and still more in preparation. They have just completed a telephone system at Old and New Michel, and an exchange has been installed; a second exchange has been established at Waldo, serving all points in that district, while a metallic line is being constructed between Waldo and Cranbrook and between Fernie and Waldo. The company will also construct at once a new metallic circuit from their main line to the Montana boundary at a point near Gateway. Construction has been commenced on the line from Cranbrook to Spokane, thereby completing connection via that city with all points in Washington, Idaho and West Kootenay.

In the course of a few days work will be commenced upon the new B. C. E. R. union depot on Columbia street, New Westminster, which will replace the building at present in use. The new station will cover a space 132 by 132 feet, necessitating the pulling down of several of the adjoining stores. The plans call for a handsome structure of red brick and granite, the interior to have tiled floors and marble walls. There will be sleeping apartments for passenger and freight crews who are on duty till a late hour.

The B. C. Electric Railway has awarded the contract for the construction of a new line from Vancouver to Burnaby Lake, a new residential district recently opened up. The new line will be seven and one half miles in length and will cost over $150,000.

At a recent meeting of the Prince Rupert Telephone Company the following were appointed directors: C. C. Westenhaver, T. D. Pattullo, Thos. Dunn, G. R. Naden, J. F. Brandt, P. Black, Dr. A. A. McIntyre, W. P. Lynch, and W. M. Law. Later the directors appointed their officers as follows: President, W. M. Law; vice-persident, T. D. Pattullo; secretary-treasurer, G. R. Naden.

The preliminary work in connection with the Jordan River power plant of the British Columbia Electric Railway, at Victoria, B.C., is being pushed forward with the utmost expedition, nearly 500 men being now at work in three gangs. Allowing for no delay in the delivery of machinery and construction materials, which have to be procured from England and Germany, there is every prospect of the plant being in operation by the end of the present year.

The steamer Oanfu, of the Blue Funnel line, which reached port a few days ago, transferred at Victoria to the cable steamer Restorer, a shipment of 45 miles of telegraph cable to be laid between Departure Bay, Nanaimo, and English Bay, Vancouver, for the Canadian Pacific Telegraph Company. The cable was specially manufactured in England for the Gulf of Georgia, and has three cores. With the laying of the new cable the Canadian Pacific Railway Company will string two more inland wires between Departure Bay and Victoria.

D. J. McQuarrie, local manager of the B. C. Electric Railway at New Westminster, has resigned his position to engage in the real estate business with his brother. D. J. Stewart, manager of the Lulu Island branch, will replace Mr. McQuarrie, while Mr. Allan Purvis, manager of the Fraser River lines, has been made manager of all interurban lines, including the New Westminster-Vancouver line, the Lulu Island line to Steveston, the Eburne line and the Fraser Valley branch to Chilliwack.

An electric lighting plant to cost $15,000, is to be installed at Merritt, B.C., by a company with a capitalization of $50,000, to be known as the Merritt Light & Water Company.

Baseball Volunteers

The baseball match between the Manufacturers and Central Station operators at the C. E. A. convention in Muskoka will be an interesting event. Mr. Geo. C. Rough, 26 Adelaide street west, Toronto, predicts an easy victory for the manufacturers, while Mr. L. V. Webber, of the Toronto Electric Light Company, is equally certain that the Central Stations will carry off the honors. There are some vacancies on both teams, and volunteers are wanted. Write either of the above-named gentlemen.

The Ohio Brass Company, of Mansfield, Ohio, announces that it has recently purchased a controlling interest in the Insulator Pottery at Barberton, which for the past two years has been making the O-B Hi-Tension Porcelain Insulators sold exclusively by it. Active management of the Insulator Pottery has been taken over by the officers of the Ohio Brass Company, and under the new management, the company, with Mr. G. A. Mead, previously chief engineer of the Ohio Brass Company, in active charge at the pottery, expects to put into effect a system that will increase the rate of production materially, thus keeping pace with the great amount of business being received. All orders and inquiries will be handled from the main office of the Ohio Brass Company, at Mansfield, Ohio, as heretofore.

A short article in our April issue on new electrical installations by the Campbell Lumber Company, was made to say that the Sissiboo Falls were capable of developing from 100 to 150 h.p. This was an error and should have read 1,000 to 1,500 h.p. We are further informed that this refers only to the present installation and that a possible development of 5,000 to 10,000 h.p. would be possible at that point.

Systematic Management of a Sales Department—Suggestions to the Retailer on how best to get Business

Soliciting new business for an electric light company is a very pleasant and profitable occupation. The work requires tact, diplomacy, energy and perseverance. Without these four qualities, no man can hope for success.

A solicitor must feel proud of his position. Eliminate the idea that you are doing something beneath you. Every merchant, banker, broker or dealer is a solicitor. He is soliciting new business daily. Every ad. published by any of the great department stores is merely a solicitation for new business. Securing a man's contract to wire his house, to install an electric flat iron or heating appliance, or to use a motor, is as important, all things considered, as to take his order for a locomotive, the closing of a contract for a $6,000 Diesel engine, or the building of a power station.

When on the field, work from house to house, store to store, office to office. Do not skip around. Finish one block, then try the next. Of course, when "calling back," you will use your own judgment, but on straight canvassing, be methodical. Sometimes the most unpromising places in appearance are the very ones in which you will be the most successful.

If you find one who is already a consumer, get after him for more lamps, heating apparatus, etc. If he complains of poor service, etc., give him due attention, report his complaint to the office, and see that the matter is made right.

In soliciting the occupants of dwellings, never go to the back door. You are selling the most necessary natural commodity over harnessed by man for his comfort and convenience. You are an educator, but it is to your interest to educate the heads of establishments, not the subordinates.

A good introductory talk may be as follows: Your company is about to extend its service for the benefit of the residents of the district, and co-operation is requested to the extent that they allow you to wire their house for electric service; the company has been put to a great expense in erecting poles and stringing wires; an investment of $60 (say) would multiply itself many fold in valuing the householder's property. You will then be able to get in the arguments that you have at your command. If your prospect be not convinced on the first call, try again and *again*.

You won't land them all. It is not a question of handing you the contract when you call; if it were, a two-cent stamp or a dime messenger would do; but you will land a great number. It means HUSTLE, not only with a capital "H," but every letter in the word must be capped.

Ductile Tungsten Now a Reality

The world's output of high-grade tungsten ore has averaged about 4,000 tons for the past four years, and the cost of production is in the neighborhood of $275.00 a ton. Before its use as the filaments of electric lamps became general, it was used almost entirely in the manufacture of "tungsten metal," a name given to a quality of steel containing a percentage of tungsten and manufactured almost exclusively by the Germans. Of the total amount of tungsten now mined each year, Spain contributes about one-tenth, most of this output coming from one mine, which is owned and operated by an English firm. Tungsten also occurs in the Cornish tin mines. It is a heavy metal having a density of 19.1. Dr. Fink, of the Research Laboratory at Schenectady, N.Y., now states that recent researches have produced ductile tungsten. In this form it is a bright, tough, steel-colored metal which can be drawn into wires less than one-thousandth of an inch in diameter and having a density of 20.19. In this same paper the resistivity of tungsten is given as 6.12 for hard drawn wire and 5 for annealed wire, as compared with 1.59 for copper. The temperature co-efficient of tungsten is given as .0091, as compared with .0045 for copper.

Personal

Charles E. Taylor, superintendent of the Edmonton Street Railway since its inauguration two years ago, has resigned.

A. L. Woolf, representing the Canadian Tungsten Lamp Company, was in Halifax and Sydney last week, and is at the Corona Hotel, Montreal. He is anxious to get back in time for the electrical convention in Muskoka.

N. R. Gibson, hydraulic engineer, of the firm of Smith, Kerry & Chace, is on a western trip, and will visit the works of the Calgary Power Company, now under construction, as well as others of this firm's undertakings in the west.

Walter Piggott, for some time acting manager of the Windsor, Essex & Lake Erie Street Railway, has resigned owing to pressure of other business. Albert Eastman, of Syracuse, N.Y., a practical electric railway man of experience, succeeds Mr. Piggott.

Charles J. Laycock has been appointed by the city of Stratford to take charge of the layout of the system of poles and wires for light and power. The installation includes three 150 k.w. transformers and complete equipment for 800 75-watt tungsten lamps.

William Fitzgerald Kelly, the recent addition to the Canadian Tungsten Lamp Company's selling staff, is at present working the Thunder Bay district, having just completed a most successful trip through Owen Sound, Collingwood and Barrie. Mr. Kelly is a new member of the Drummer's Association, but is fast making friends amongst the Western trade.

Ewart B. Walker, of the firm of Chapman & Walker, Limited, has recently returned from a short visit to England and the Continent where, we understand, he succeeded in securing the sole Canadian rights for the Bergmann Elektricitats-Werke Aktiengesellschaft, of Berlin, the British Electric Transformer Company, of London, England, and the Gilbert Arc Lamp Company, of Chingford, Essex. The Bergmann Electrical Company, the second largest of its kind in Germany, employs a staff of about 15,000 men, and is engaged in the manufacture of electrical apparatus, on a very large scale. The founder of this company had his first experience with the Edison General Electric Company, U. S., and since then has kept in close touch with American practice, so that it is claimed for the Bergmann apparatus that it combines the advantages of European and American design. The British Electric Transformer Company, manufacturers of the well-known "Berry" transformer, devote themselves exclusively to the art of transformer building and their success is apparent from the fact that about two-fifths of the world's output of transformers is manufactured under their patents. Mr. Walker states that a keen interest in Canadian electrical matters is everywhere noticeable on the continent, where they are now fully advised of the magnitude of Canada's operations. The removal of the surtax on German goods has been a factor in this respect, having made competition possible now on more equal terms.

Recent Trade Publications

How to Build a Rural Telephone Line.—A helpful booklet, by the Stromberg-Carlson Telephone Manufacturing Company, Rochester, explaining, with illustrations, the various phases in the construction of a small telephone system suitable for a rural section.

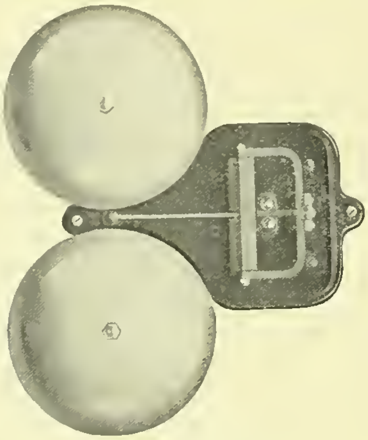
The Canadian Turbine Water Wheel.—By Charles Barber & Sons, Meaford, Ont. Catalogue No. 12, describing the design, special points of excellence, gate mechanism, etc., of their turbines. A very complete set of tables is appended, showing the relative value of head, speed, water volume and horse-power. These tables apply to wheels varying in size from 12 inches to 70 inches, operating under heads varying from 4 feet to 100 feet. Well illustrated.

Telephone Department

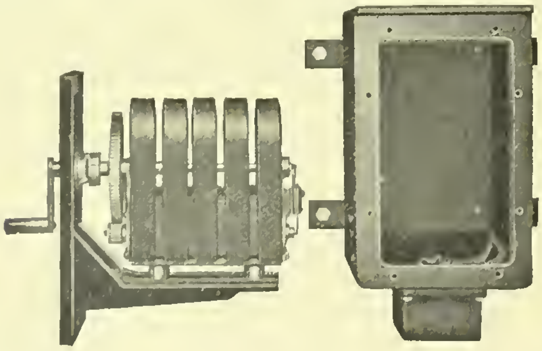
Mine Telephones and Signalling Sets—Must be Absolutely Waterproof—Many Recent Improvements

The art of making an absolutely waterproof iron clad magneto telephone that will resist climatic conditions and those prevalent in underground workings, is claimed to have been successfully accomplished in the Stromberg-Carlson Telephone Manufacturing Company's No. 890 Mine Telephone.

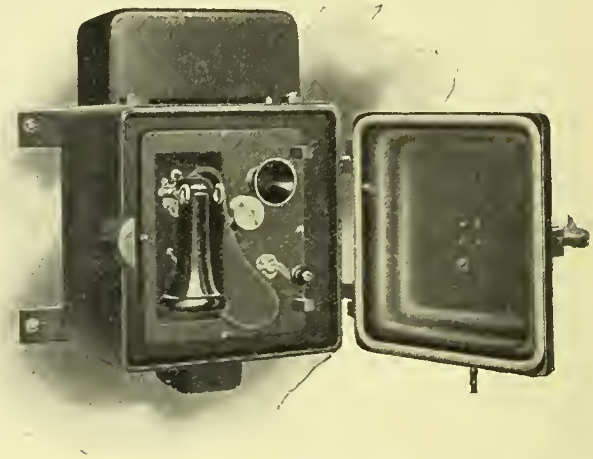
All the apparatus in this instrument is enclosed within a hermetically sealed inner compartment, allowing only the receiver and the crank for the magneto generator to be exposed. The receiver must necessarily be exposed in order that the user can hear the conversation from the party he has called or been signalled by. The receiver cord must be flexible and at the same time waterproof, and of such length as to enable the user to conveniently stand before the instrument. The cord used for this purpose is of the switchboard type, having an extra insulation of pure rubber, over which is braided a strong linen covering saturated in beeswax so as to fill up the apertures between the weavings. A new receiver cord take-up device is used, which automatically releases and winds up the cord so that it cannot lay over the edges of the box and be crushed and broken when closing the door hurriedly. Another simple improvement is the metal mounting for the generator in place of wood. Irrespective of what precautions are taken to protect the contents of a mine telephone, it is found that wood will shrink and expand and place the generator out of alignment, thereby making the crank shaft bind in the door and making it impossible to operate the generator or signal any other station in the system.



Bell—Open View

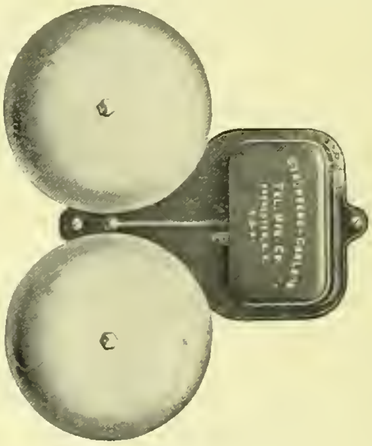


Generator—Open View



Open View—Mine Telephone

The signalling set consists of a loud ringing signal bell and a magneto generator. The signal bell is a polarized ringer operated by an alternating current magneto generator. The frame and housing for the armature and clapper rod mechanism are of cast metal finished with a special enamel which is rustproof. Either six or eight-inch gongs can be mounted on this bell. By referring to the illustration it will be seen that the armature mechanism is free from complicated adjustments. The magnetic coils are thoroughly protected from moisture by being encased in metal cases that are hermetically sealed. Ten of these bells on a bridging line can be successfully operated from one generator, and under favorable conditions as many as twenty may be rung satisfactorily.



Bell—Closed View

Generator—Closed View

The Iron Clad Magneto Generator is also a waterproof equipment. Detachable mounting bars are furnished. The cast iron housing is made with a drip on the front over the door. Incoming wires are terminated in the terminal box mounted on the lower side of the casting. As will be seen by the open view illustration, the generator is mounted on the shelf which forms a part of the front door, eliminating the feature of mounting the generator on a separate plane. The crank handle passes through an air-tight gasket mounted on the door and engages a shaft coupling on the opposite side.

Telephone Contracts Must be Approved—The Bell Said to be Evading the Law—An Independent View Point

The secretary of the Canadian Independent Telephone Association writes the following letter answering a statement made by the Bell Telephone Company to the effect that all agreements entered into between the Bell and other telephone companies have been submitted, as required by law, to the Board of Railway Commissioners of Canada. As we understand the letter, the Bell Telephone Company claims 301 connections with other companies, and, therefore, it would appear, the same number of approved agreements, while the Board of Railway Commissioners, on the other hand, state that they have only approved 95 agreements. The discrepancy in numbers is so large and the questions at issue so important to the Independent Telephone companies either organized or about to organize throughout Canada, that we print the letter in full, hoping thereby to lend assistance in determining the actual existing conditions.

Toronto, Ont., May 9th, 1910.

Editor, Canadian Electrical News.

Sir,—The April issue of the "Telephone Gazette," a semi-official publication of the Bell Telephone Company of Canada, which is widely distributed among the proprietors of rural telephone systems, contains the following:

"A statement is being persistently circulated by an interested party that the contracts between the Bell Telephone Company and associate companies for exchange of service have not been submitted and approved by the Board of Railway Commissioners for Canada, as required by the Railway Act, and that, therefore, they cannot be binding upon either of the parties thereto. This statement is entirely erroneous. All the contracts which this company has entered into with other companies for exchange of service have been submitted to the Board as required by law and the regulations of the Commission, and the approval of the Board obtained."

As the Canadian Independent Telephone Association is doubtless the "interested party" referred to, I would ask you to be good enough to permit me through the medium of your columns to throw some further light upon this important question of the legality of the contracts existing between the owners of the various independent telephone systems and the Bell Telephone Company of Canada for interchange of service.

The Dominion Railway Act states that unless these contracts have been submitted to and approved by the Board of Railway Commissioners for Canada they shall have no force or effect. Believing it was acting in the interests of the owners of the systems interchanging service with the "Bell," this Association some time ago took steps to ascertain whether these contracts had been submitted to the Railway Commissioners for approval, with the result that it was informed officially that the Board had not had an opportunity of examining these contracts, nor had the provisions of any such received its consideration. This information was imparted to the various independent companies in Ontario for no other purpose than that of placing the facts before the parties most interested and to enable them to understand the legal conditions under which they were exchanging service with the Bell Telephone Company.

It will be seen, from the statement quoted above from the "Telephone Gazette," that the Bell Telephone Company disputes the assertions of this Association that these contracts have not received the approval of the Railway Commissioners. In order, therefore, to overcome any possible misunderstanding in regard to this question, this Association placed itself in communication with the Board of Railway Commissioners and has received a reply from the Chief Commissioner enclosing a list which, so far as he is able to ascertain, covers all the agreements which have been filed with the Board for approval up to May 4th, 1910. This list contains the names of ninety-five companies, persons and municipalities, only seventy-eight of which are included in a list of 301 companies, associations and private lines connecting with the Bell Telephone Company of Canada in the Provinces of Ontario, and Quebec, as published in the Company's Toronto Directory, dated November, 1909. It will, therefore, be seen, without making any allowance for the additional systems which have been organized since the November Directory went to press, that there are 223 contracts for interchange of service which the Bell Telephone Company has not submitted to the Board for approval. I do not, therefore, consider that the Independent Association has any apology to make for reiterating the statement that *all* the agreements for interchange of service have *not* been submitted to the Board of Railway Commissioners for approval, and that if the section of the Dominion Railway Act referring to these contracts, means anything at all it means that all such contracts not so submitted are not legal or binding on the parties thereto.

This Association is also advised by the Chief Commissioner that the Railway Board has never laid down any conditions of any character or kind whatever, as between the Bell Company and independent companies. The Board has so far granted its ratification of the agreements for no other reason than that the parties thereto have agreed with each other as to the business relations which shall exist between them. The order approving these contracts up to the present time is merely a temporary form, is entirely informal in character and in no case represents the considered judgment of the Board upon the merits of the contracts.

The Canadian Independent Telephone Association, in view of the facts above stated, would impress upon all parties, who may contemplate entering into connecting agreements with the Bell Telephone Company, that they are perfectly free to accept or reject any terms proposed for interchange of service, and that the matter of making these contracts for interchange of service is one which rests entirely between themselves and the Bell Telephone Company.

In the event of failure to come to an agreement the Board of Railway Commissioners may be appealed to, but up to the present time the Board has not laid down any conditions governing interchange of telephone service, and any statement to the contrary is not only misleading, but is absolutely unwarranted by the facts.

(Signed) FRANCIS DAGGER,
Secretary-Treasurer,
Canadian Independent Telephone Association.

Canadian Tungsten Lamp Company Enlarging Again

When the Canadian Tungsten Lamp Company opened their new wing with a very successful dance last fall, they certainly thought that the new addition to their floor space would be ample for some time to come. The claims of their business, however, have already overcrowded the space, and they have been compelled to commence a new wing on Cannon street, east of their present factory, having purchased two large parcels of land specially for this purpose. Evidently, courteous treatment and first quality goods are bringing this aggressive firm even more success than they anticipated.

Mr. Charles Morton, formerly manager of the Temple Electric Company, Montreal, and later manager of the Central Light & Power Company, died recently at his home in Montreal.

Carbon Company Erecting New Factory

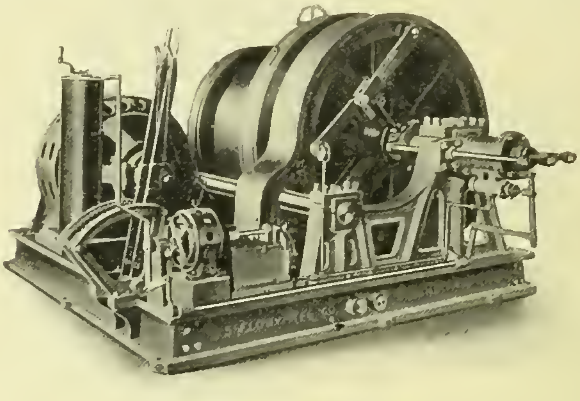
The Canadian National Carbon Company are erecting a factory in Toronto, which they hope to have well towards completion by the end of this year. The company plans to have ample capacity in the manufacture of dry cells to supply the entire Dominion. They will also manufacture various other carbon commodities required in connection with electrical apparatus, and in due course expect to have a very complete carbon factory, which will be fitted with the most modern devices and machinery.

New Type of Service Boxes

A line of service boxes embodying new features is offered the trade by the Detroit Fuse & Manufacturing Company, Detroit, Mich. In addition to being water tight and rust proof, the "Detroit" Service Box is a quick make and break fusible switch. The switch mechanism which is operated from the outside of the box, can be controlled instantly, and without danger of accidental short circuit. This feature is appreciated when installations are made in manholes or in damp basements, for which service this line is especially recommended. Also in replacing blown fuses, you do not touch or come in close contact with any live parts. The switch mechanism is simple, and is controlled by one spring of sufficient strength to throw the switch either on or off independently of other pressure. Figure 1 shows the outside view, and it is noted that the box is threaded for conduit, and is provided with enlarged ends doing away with bending of wires, and allowing plenty of room in wiring. The box can be sealed to prevent tampering, yet the switch mechanism can be instantly controlled by means of the handle, as shown in the cut. Hinges, plunger rods, and wing nuts are of brass, and the cover is provided with a gasket, giving a water tight construction. Figure 2 shows the inside construction, a triple-pole box. Note that the outside legs are fused for National Electrical Code Cartridge fuses, while the neutral leg is connected directly across the terminals. Also, the terminals are of the solder lug type, and sufficiently large to take No. 2 wire. It is impossible to make or break the circuit by opening or closing the cover, so that the switch must always be operated by means of the quick make and break mechanism.

Electric Motor Driven Mine Hoists

The accompanying figure illustrates a single drum mine hoist with a Westinghouse electric railway air compressor and air reservoir mounted on the base of the hoist. The reservoir is connected to the air cylinder at the end of the drum shaft. The air valves are actuated by a lever shown close to the battery of two levers and controller. Very little exertion is required by the motorman to throw the friction in and out of contact, as it is of the toggle type. After the air pressure is put on the contact continues until the friction is reversed by the reverse motion.


Single Drum Mine Hoists

The drum is 60 inches in diameter; 48 inches long between the flanges, and is designed for an 8,000 pound rope strain at a speed of 500 feet per minute. The hoist is operated by a Westinghouse type "HF" 150 h.p. alternating current motor. This type of induction motor is especially suited for application where a strong starting effort is needed. It is well adapted for use on circuits carrying lighting loads, as the starting of it does not appreciably affect the voltage regulation. These motors are controlled by standard Westinghouse single handle, reversing, drum type controllers, which insert resistance in the secondary at starting and gradually cut it out as the hoist speeds up; the controller has a large number of points that gives smooth acceleration. When the controller is in the off position, the motor is entirely disconnected from the line.

New Electric Factory

The Radiant Electric Manufacturing Company, under the management of Mr. S. E. Hewitt, has opened a factory and offices at 35 Adelaide street west, Toronto, for the manufacture and assembling of various kinds of household electrical appliances. The company controls the patents in Canada for a special composition conducting wire for which great heat radiating power for small current consumption is claimed. Mr. Hewitt is well pleased with the reception his products are receiving, especially throughout Western Canada.

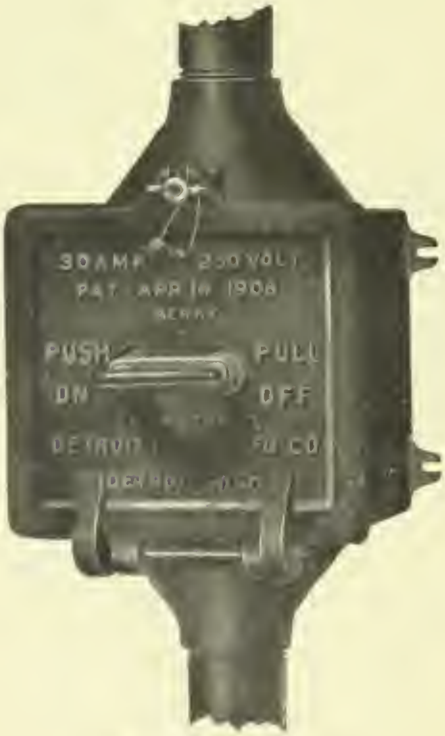


Fig. 1 Outside View Service Box

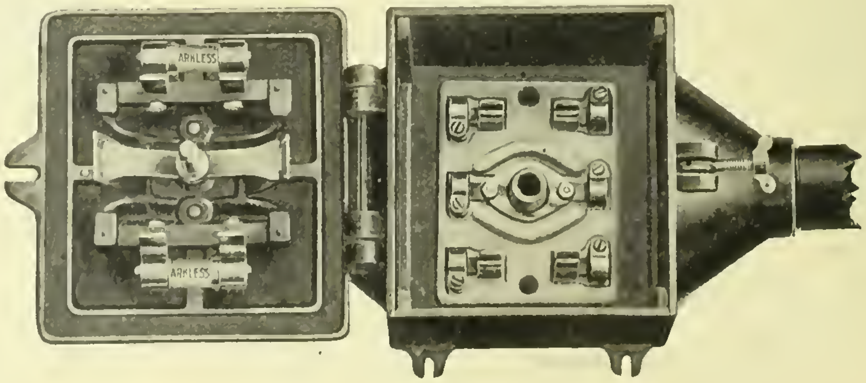


Fig. 2—Inside View Service Box

Current News and Notes

Armstrong, B.C.

The Hydro-Electric power plant at Davis Creek Falls has proven so unsatisfactory that plans are under consideration for the installation of a steam plant to replace it.

Barrie, Ont.

The Monarch Railway is seeking a 25 year franchise to run its lines along certain streets here, connecting with Toronto; construction to commence within 2 years.

Brandon, Man.

The additions to the hydro-electric plant of the Brandon Electric Light Company on the Little Saskatchewan river, eight miles from this city, are about completed and are already in operation. The installation now consists of two 500 h.p. generators which will be increased to four in the near future. The company's steam plant situated within the city limits also generates 2,000 h.p.

Fifteen hundred telephone poles, the property of the Manitoba Government, were destroyed by fire in the C. N. R. yards. The loss will be about $2,000.

Bowmanville, Ont.

On May 31st this town will vote on a by-law authorizing the corporation to pay $12,000 for the plant of the Oshawa Electric Light Company, which furnishes light and power to the town of Bowmanville.

Bracebridge, Ont.

P. Hutchison, secretary-treasurer, Bracebridge & Muskoka Lakes Telephone Company, writes that owing to some changes having to be made the contracts have not yet been let, for the construction of line from Port Carling to Bala.

Calgary, Alta.

The $70,000 electric light plan extension by-law was carried by the ratepayers.

Camrose, Alta.

M. A. Maxwell, of Boston, has been asked to draw plans and specifications for an electric plant. Probable site, north bank of Stoney Creek, east of G. T. R. bridge.

Cranbrook, B.C.

The Quain Electrical Supply Company, head office Cranbrook, is being formed to carry on business in electrical appliances and supplies. These will find all the readier market in this city as 24-hour power will be available about June 1st.

Dawson, Yukon District.

The North Fork Power Company will soon commence work on the construction of an extensive development on the north fork of the Klondike. Seven and one-half miles of ditch will be built. Charles Boyle, resident manager of the Canadian Klondike Company, has charge of the work.

Edmonton, Alta.

The city of Edmonton, electrical department has established a department for the sale of all kinds of household electrical appliances. It is understood these articles will be sold at such a price as will just cover the expenses the city incurs in handling them.

Elora, Ont.

The Ontario Power Commission has informed the authorities that Niagara power delivered at Elora would cost $35.25 per horse power, the same rate as quoted for Fergus. This rate is calculated on a basis of 200 horse power being taken at Fergus and 150 at Elora, the power line running up from Guelph.

Estevan, Sask.

The by-law authorizing the expenditure of $25,000 for a municipal electric light plant has been passed.

Fort George,

The Fort George Power Company, incorporated as a limited liability company, will proceed immediately to construct and operate water works at Fort George. They propose also manufacturing gas, electricity, and to construct houses, etc.

Fort Saskatchewan, Alta.

The ratepayers will be asked to vote on the expenditure of $10,000 for construction of electric light plant on Sturgeon river. Mr. Lynn, engineer.

Fredericton, N.B.

The annual meeting of the New Brunswick Telephone Company showed a surplus for the year of $5,474. The usual dividend of 6 per cent. will be paid. The company purposes expending $35,000 on extensions to the St. John office, to meet which expense new stock will be issued. The number of telephones has increased during the year from 8,410 to 9,035. The following are directors of the company: S. H. White, Senator F. P. Thompson, F. B. Black, A. W. Bennett, H. P. Robinson, R. O'Leary, W. B. Snowball, A. R. Slipp, J. M. Robinson, G. W. Ganong, R. B. Emerson, L. B. McFarlane, F. B. Carvell, J. L. McAvity, F. W. Sumner. Mr. McFarlane belongs to Montreal, and represents the Bell Telephone Company.

Fort William, Ont.

Stewart & Hewitson were awarded a contract for rock and screenings at $1.35 a cubic yard, by the Fort William Street Railway Company.

Tenders are being called by street railway construction department until June 2nd for the supply of the materials needed in the construction of railroad. Specifications at City Engineer's office. A. L. Farquahrson, construction superintendent.

The Carter-Jones Electric Company, of this city, will commence work shortly on a telephone system in Oliver township. There will be 100 miles of wire strung and 800 poles placed in position.

Fort Frances, Ont.

The Minnesota & Ontario Power Company has made application to the Dominion Government for permission to export 6,000 h.p. to operate the Minnesota industries established just across the line, and which are under the same ownership as the power plant. The application is opposed by the town of Fort Frances.

The Dominion Cabinet has refused to give its consent to the export of power from the Canadian side to the United States town of International Falls. About 15,000 h.p. will now be available to the town of Fort Frances. The price of the power is now being considered by the Hydro-Electric Commission of Ontario, which will use the power vested in them by the Government to compel the power company to deliver power at the lowest possible rate.

Francis, Sask.

Tenders are invited for the construction of fifteen and three-quarter miles of rural telephone system. Colin Wells, secretary-treasurer, Rural Telephone Company.

Garvin, Sask.

Tenders will be received until July 15th for the construction of a telephone line. W. Geier Switzer, secretary-treasurer, Arm River Rural Telephone Company.

Galt, Ont.

A by-law is being submitted to the corporation of the town of Galt giving the Galt, Preston & Hespeler Street Railway Company the right to build a single line along certain streets of Galt in order to connect with the manufacturing premises of Shurley & Dietrich, The Goldie, McCulloch Company and Sheldons, Limited. The privilege of carrying freight between the hours of 10 p.m. and 7 a.m. is included.

Hamilton, Ont.

The Ontario Pipe Line is suing the Dominion Power and Transmission Company, the Cataract Power Company and the Hamilton Street Railway Company in an action for a perpetual injunction to restrain the defendants from attaching their wires to the water mains and thereby setting up electrolysis in the plaintiff's pipes.

Ingersoll, Ont.

The by-law to raise $39,000 for the purchase of power plant, etc., and another to provide a sum of $15,000 to augment equipment and prepare for distribution of electricity was passed.

Kingston, Ont.

The Northumberland Durham Power Company has made a proposition of cheap power to the Board of Trade here.

Lloydminster, B.C.

The ratepayers ratified a by-law passed by the town council granting a franchise for eight years to W. Johnson for the operation of an electric light plant.

The plant of the Electric Light Supply Company has been taken over by Mr. Wm. Johnson, to whom the town has granted a 7-year franchise with freedom from taxes and other privileges.

La Tuque, Que.

It is rumored that the municipality of La Tuque will erect an electric lighting plant at an estimated cost of $50,000.

London, Ont.

Tenders will be called for at once for the steel tower to carry the wire into the Horton street subway. Engineer Glaubitz has prepared plans; estimated cost, $850.

Tenders will be called for at once for the building of an underground conduit, 6-inch, 9-inch and 12-inch. Engineer Roberts.

The G. N. W. Telegraph Company have refused to allow their wires to be placed underground with the high tension wires of the distributing system.

The asylum requirements will amount to about 700 h.p. and will be credited to the city. The price to the asylum will be such as will give the city a fair profit.

The domestic rate for lighting has been reduced by the London Electric Company from 9 to 5 cents per k.w.h. The London

Water Commissioners propose to declare a competing rate of 4 1-2 cents per k.w.h., which may be still further reduced if the private company meets this rate.

Recent conferences looking to an agreement between the city and the telegraph companies to use the same underground conduit appear to indicate that amicable arrangements will be made.

City Engineer Roberts is authority for the statement that London will soon be one of the best lighted cities in Canada. It is proposed to place a 60 c.p. tungsten lamp, with Wheeler reflector, on every other pole. Practically the whole of the city will be covered in this way at a cost of about $6,500. Magnetic arc lights were also discussed, but, in spite of their much lower cost, did not meet the approval of the commissioners.

It is understood that a price of about $33 per horse-power has been quoted the London Street Railway Company by the Hydro-Electric Power Commission. The regular offer being made by the Commission to all such companies is one-half cent per kilowatt hour, with privilege of 5 minutes overload; for longer duration than 5 minutes the maximum quantity to be paid for during the whole month. This offer is subject to the condition that 65 per cent. of the contract amount must be paid for whether used or not. Municipalities taking power for other purposes are being allowed 20 minutes overload but are required to pay for 75 per cent. of the amount contracted for.

Medicine Hat, Alta.

A by-law to raise $57,000 for the installation of an electric light plant will shortly be introduced.

Moncton, N.B.

The agreement drafted by the city and the street railway provides that the construction of the street railway will commence on or before March 26th, 1911. This will be submitted to the ratepayers on May 27th.

The city council has ratified the agreement with the street railway company to lease the civic lighting plant for 30 years. The company agrees to reduce the price of lighting and to pay a rental on a percentage basis with the minimum of $10,000 annually. A plebiscite on the agreement will be taken on May 27th.

Merritt, B.C.

At a meeting of the Merritt Electric Light & Water Company it was decided to install a modern electric lighting system costing over $15,000.

Moose Jaw, Sask.

Tenders are being called until May 7th for the erection of telephone building. Plans, etc., on application to Storey & Van Egmond, architects, Regina.

The Moose Jaw, Granton and Blue Hill Rural Telephone Company have organized and will build a 44-mile line from Moose Jaw south to Blue Hill.

The new central energy system to be installed in this city will be in operation during the present year. After that date standard government yearly rates will be in force which are as follows,—business phone, $35.00; residence $25,00; party line of two, $18.00 each.

Dr. Lee de Forrest states that a wireless telephone station will be under construction in Moose Jaw by July 1st of the present summer.

Montreal, Que.

The bonds of the Calgary Power Company, amounting to $1,200,000, have been disposed of in London, England. It is understood the price received is very gratifying to the directors, which include H. S. Holt, president, R. B. Bennett, A. E. Cross, W. H. Hogg, E. R. Wood and W. M. Aitken.

The Montreal Light, Heat & Power Company have reduced their light rates. The residential rate for five-year contracts is cut from ten cents a kilowatt hour to eight cents, and the commercial rate from ten cents to nine cents. Meter rates have also been reduced from twenty-five to fifteen cents a month.

The Vickerson Electric Company moved into larger quarters at 23 St .George street on the first of May.

A company is said to be forming here to develop a 15,000 h.p. falls on Union Creek, about 16 miles from Fort Simpson and 30 miles from Prince Rupert, the G. T. P. western terminus. The name is to be the Pacific Pulp & Power Company. In addition to the requirements of their own large pulp mills the company will supply Prince Rupert and Fort Simpson with light and power.

Nelson, B.C.

The report that the C. P. R. will electrify the Crow's Nest Pass line is revived by the statement of an incorporation of a company capitalized at $1,000,000 to develop power from the Pend D'Oreille river at its junction with Salmon river.

The International Electric Company, of Nelson, B.C., incorporated to develop power on the River Pend d'Oreille at its point of junction with the River Salmon, will ask for power to divert 4,000 cubic feet per second. This amount with a 90-foot head, which it is claimed may be obtained at this point, will develop about 25,000 h.p.

Neepawa, Man.

On May 18th a by-law will be submitted to ratify agreement between the government for the transfer and sale of the telephone plant to the government.

New Hamburg, Ont.

The ratepayers of New Hamburg will vote, in the near future, on a by-law to purchase the electric light plant from Mr. J. Morley. It will then be operated by the municipality with Niagara power.

North Bay, Ont.

Connection has been established with Tomico Mills and Northland Mills on a private line connecting with the Bell Telephone Company at North Bay.

New Westminster, B.C.

Plans of the new B. C. E. R. depot have been prepared and tenders will be called shortly. Cost, $80,000.

The Fraser River Lumber Company is planning to increase its electric generating capacity by a new 1,000 k.w. generator. This will bring the total capacity of their electric plant to 4,000 kilowatts.

A delegation of the Delta Board of Trade will seek an appointment with the Vancouver Board of Trade in an effort to interest that body and secure its assistance in obtaining direct tram connection between Delta municipality and Vancouver. The same delegation will also interview B. C. E. R. officials in the matter.

Ottawa, Ont.

The proposed street railway extensions have been approved by council.

The following are culled from the supplementary estimates, ending March 31, 1911: Maritime Provinces: Hawkesbury, Meat Cove, lines along shore of Gulf of St. Lawrence, renewal of poles, $3,000; Meat Cove, Baddeck line, extension from Baddeck via Nyanza to Little Narows, $2,350. British Columbia, extension of Courtney, Campbell river telephone line from east shore of Vancouver Island, etc., $11,900; Kamloops, Okanagan Valley telegraph and telephone lines, $11,000; Ashcroft-Dawson main line, telegraphic communication between Port Simpson and Stewart, $16,000, etc.

Active discussion is in progress concerning proposed new electric wiring regulations. The representative of the Underwriters' Association has stated that he considers the work done in Ottawa installations the worst he has ever seen.

The Railway Commission is sending out an order requiring all street railways under its jurisdiction to equip their larger cars with air brakes. The order will not apply to Montreal or Toronto which operate under Provincial Boards.

The negotiations between the Ottawa Street Railway Company and its motormen and conductors, have resulted in the following schedule of prices: First year men, 19 cents an hour; second-year men, 20 cents an hour; over two years' service, 22 cents an hour. For Sunday work the rate is 2 cents an hour extra for all.

In the Court of Appeal the Ottawa Electric Railway lost its appeal from the judgment awarding one Smith $2,500 damages. Smith, while riding a bicycle down a lane in Ottawa towards Sussex street, on which the electric cars run, came into collision with a car and was injured, and sued for damages on the ground that the accident was caused by the excessive speed of the car, and by the motorman not ringing the bell.

Owen Sound, Ont.

It has been decided to place twenty-one electric arches over the main thoroughfare, these to be 100 feet apart, and to carry incandescent lamps.

Orillia, Ont.

The right of the town of Orillia to dam the Ragged rapids, where the town's electric plant is located, has a second time been upheld by the High Court, Justice Middleton presiding. Herbert Doolittle, of Sparrow Lake, brought action against the town for damages caused to his land by floods. Judgment was given dismissing the action with costs.

Port Arthur, Ont.

The city council passed a strong resolution addressed to Premiers Whitney and Laurier, protesting against the exportation of electrical power from Port Frances to the United States side of the border line.

A record was made in the operation of the street railway during the month of April. The office records show that from April 1st till April 30th every car left terminals on time and arrived at the other end of its journey on time, and vice versa. There is not as much as one minute's delay chalked up against any car in the service for the whole of the past month, while the amount of traffic handled has been above the average.

Portage la Prairie, Man.

The proposition of C. Chamberlain, of the Great Fall Power Company to furnish power to the city for a term of 30 years, etc., was accepted.

Prince Rupert, B.C.

James Milne, consulting engineer, of Vancouver, has let contracts for steam and electrical apparatus required by this city. The awards were as follows: Boilers,

THE

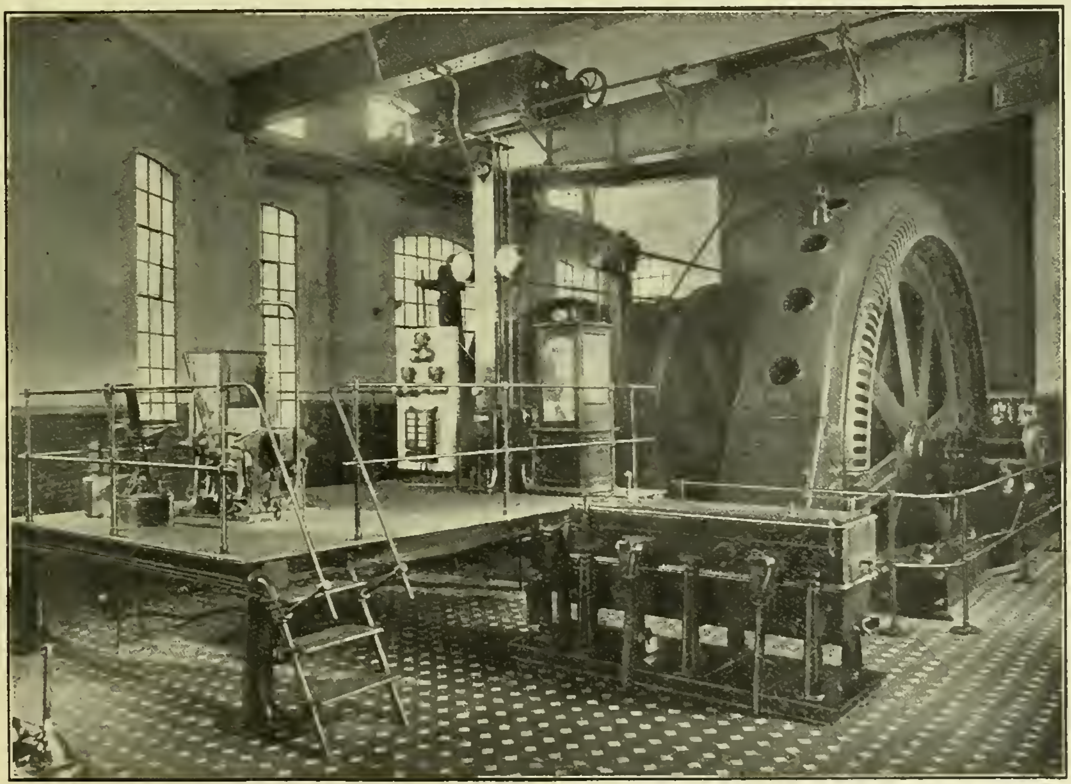
SIEMENS

COMPANIES

Siemens Bros. Dynamo Works, Ltd. -	London and Stafford
Siemens Bros. & Co., Ltd. - - -	London and Woolwich
Siemens Schuckertwerke G. m. b. H. -	Berlin and Nurnberg
Siemens & Halske A. G. - -	Berlin and Nonnendamm
Gebruder Siemens & Co. - -	Berlin and Lichtenberg

MANUFACTURERS OF

Complete Electrical Equipments for Steel Works, Tin-Plate Works, Rolling Mills, Electric Winding Engines (Siemens Ilgner System), Generators, Transformers, Motors, Switch Gear, etc.



3-phase Electrically Driven Winding Engine supplied to THE HARTON COAL CO., LTD. winding 207 tons of coal per hour from a depth of 1,424 ft.

Siemens Bros. Dynamo Works

Canadian Birkbeck Bldg., TORONTO Limited

HEAD OFFICE FOR CANADA

pumps and piping, Goldie & McCulloch Company, Galt, Ont.; surface condenser, circulating and air pumps, John Inglis Company, Toronto; exciter and switchboard, Canadian Westinghouse Company, Hamilton, Ont.; cross compound engines, Robb Engineering Company, Amherst, N. S.; alternators and arc apparatus, Canadian General Electric Company, Toronto. The total cost of the plant will reach about $60,000.

Quebec, Que.

Tenders will shortly be invited for the construction of a concrete dam and power house at St. Alban. J. F. Guay, consulting engineer, Morin Building, Quebec.

The Montreal Street Railway Bill was passed by the Railway Committee recently, after being subjected to an amendment and an addition. The amendment states that the said company shall not exercise in the city of Montreal any privileges or franchise mentioned in this Act, without the previous consent of the said city, such consent, if granted, shall be given by law as provided by the city charter, and such bylaw shall contain all the conditions which the city may deem advisable to insert therein, for the protection of its interests. A second amendment stipulated that the work shall be started at once ,and that the company must spend two million dollars in four years, or lose its franchise.

The various bills relating to electric railway and light and power companies have all been passed subject to the condition that the consent of municipalities must be obtained before entrance can be made. In case of refusal the matter is to be referred to the Public Utilities Commission. The Canadian Light, Heat and Power Company, however, got through without this restriction.

The Canadian Light and Power Bill was passed by the Private Bills Committee of the Upper House recently, but an amendment was incorporated saying that any rights to amalgamate with other companies should not apply to the Montreal Light, Heat & Power Company, or affiliated companies.

Ruskin, B.C.

The Western Canada Power Company are installing a small generator unit for driving electric locomotives on the railway being built between Stave Falls and Ruskin station on the C. P. R. This line, some seven or eight miles, will be used for transporting the machinery for the main generating station.

Regina, Sask.

The popular vote taken on the Street Railway question in Regina resulted in an overwhelming majority in favor of a municipally-owned railway system. It is probable that the success that has been made of the municipal lighting plant in Regina during the past couple of years influenced the vote considerably, as the terms of the franchise were very favorable to the city.

The Provincial Department of Railways and Telephones have awarded contracts as follows: Moose Jaw to Outlook, Martinson & McCutcheon, of Elbow; Saskatoon to Humboldt, Simpson & Craig, Virden; Wapella to Carlyle, Martin Misferdt, Alameda, Sask; Abernethy to Esterhazy, with branch to Melville, to R. & D. McLeod, Winnipeg. Construction work to commence by May 1, and completed in two or three months.

The following telephone companies have been recently incorporated in Saskatchewan: The Fairplay Rural Telephone Company, The Fleming North Rural Telephone Company, The Empire Rural Telephone Company, The Belbeck Rural Telephone Company, The Kenilworth Rural Telephone Company, The Dalmeny Rural Telephone Company, The Edgeley Rural Telephone Company, and The Maple Leaf Rural Telephone Company.

By a vote of over two to one the by-law to grant the street railway franchise to J. W. DeC. O'Grady, of Winnipeg, and associates, was defeated.

The East Line Rural Telephone Company, Limited, was incorporated on April 11th. Registered office, Abernethy.

Sturgeon Falls, Ont.

The Bell Telephone Company has established connections at Sturgeon Falls with a private telephone line extending to Dunnock, Notre Dame du Lac, St. Charles, Verner and Warren.

Saskatoon, Sask.

This city has signed a contract with the Saskatoon Power Company for the harnessing of the South Saskatchewan river, 14 miles below the city.

St. John, N.B.

Improvements and extensions in the street railway system are under way in this city.

The newly appointed Public Utilities Commission for the Province of New Brunswick, consists of Col. D. McLeod Vince, chairman, O. M. Melanson, Shediac, G. O. D. Otty, St. John; F. P. Robinson, Fredericton, secretary-treasurer. The companies coming within the scope of the Board's inquiries are those engaged in telephone, heat, light, water, power and street railway business. It is probable the New Brunswick Telephone Company will be the first to have its affairs probed by the new commission.

Selkirk, Man.

The town of Selkirk has entered suit against the Selkirk Electric Light & Power Company, Limited, to prevent their continuing to carry on their electric lighting business in the town.

St. Thomas, Ont.

The Carter Jones Electrical Company has been awarded the contract to erect 100 miles of wire to supply a telephone service over an area of 25 miles in Oliver Township. About 800 poles will be needed. Work will commence at once and is to be completed by the end of June.

Stewart, B.C.

Piping, lighting and pumping plants and a boiler have been shipped north to Stewart by the Stewart-Portland Canal, Light, Water & Power Company. They will serve temporarily for serving the wants of the little town pending the installation of a hydro-electric plant next year on the Marmot river where a large water right has been secured. Then the company will sell power to the various mines.

St. Boniface, Man.

The town council of St. Boniface decided on the 16th inst., to acept under certain conditions, a proposal from Mr. Chamberlain, representing the Great Falls Power Company, to furnish the town with 5,000 h.p. at the city limits at $18 per h.p. per annum, and an additional 5,000 h.p. in blocks of 100 h.p. each as required, at $17 per h.p. per annum. Among other conditions the town required the company to furnish within a specified time a deposit of $20,000 as evidence of good faith.

Stratford, Ont.

Tenders are to be called almost immediately for the $75,000 electric distribution plant for Stratford.

Toronto, Ont.

The construction department of the Safety Insulated Wire & Cable Company, 114 Liberty street, New York, has been awarded the contract for laying conduit under railroad crossings at Toronto, for the Hydro-Electric system; amount of contract $11,387.08.

The American Sewer Pipe Company were given the contract for supplying conduit reqnired by the city in connection with the hydro-electric system at the following prices per duct foot: Butt joint, round bore, .0590 cents; square bore, .0635 cents.

The Cobalt Hydraulic Power Company, Limited, is suing the Cobalt Power Company, Limited, for $24,992, "price of electrical power supplied by the plaintiffs to the defendants."

The application of the Toronto Railway Company for permission to lay tracks on certain streets of the city has been granted in toto by the Ontario Railway and Municipal Board.

Messrs. Chas. M. Jacobs and Jas. Forgie, New York, of the engineering firm of Jacobs & Davies, have been in Toronto looking over the situation in this city with reference to a subway railway.

The Board of Control has approached the Railway Commissioners to ascertain if it will hear an application by the city for an order to compel the Bell Telephone Company to give a flat 'phone rate to all parts of the city. At the present time residents of Ward Seven and other outlying sections of the etiy have to pay a much higher rate for 'phones than residents in the older parts of the city.

Alex. Hultman, director of State telephones, Stockholm, Sweden, and Herman Oleson, engineer of the central administration, are in Canada examining the automatic telephone system in use in various cities here. Mr. Hultman is of the opinion, in view of Sweden's experience, that the Ontario Government should own and operate telephone trunk lines.

As an outcome of the verdict rendered by the coroner's jury, which investigated the death of Violet Harlock, who was electrocuted at Mimico, his Honor, Judge Winchester has laid the facts before Crown Attorney Baird and authorized him to prefer a charge of criminal negligence against the Inter-urban Electric Light Company, which operates the wire.

Vancouver, B.C.

The Dominion Government has appointed R. A. Stronach, of Ottawa, resident engineer at Lake Coquitlam, during the progress of the building of the Vancouver Power Company's new dam at that point.

The B. C. E. R., under the title the Vancouver, Fraser River & Southern Railway Company, proposes building an electric railway from the city boundary to the head of False Creek.

The Great Northern Railway already has in operation some 2,100 miles of telephone line for train despatching and has just ordered apparatus for the equipment of about 1,900 miles more. When complete this system will extend all the way from Minneapolis to Vancouver.

Contracts for part of the construction work on the new Burnaby line have been awarded and operations are to begin this week. The approximate distance of this new line from Burnaby to Vancouver is seven and one-half miles, and tho expenditure involved will be a little over $150,000. This piece of railway line is being constructed by the B. C. Electric Railway through its subsidiary company, the Vancouver, Fraser Valley & Southern Railway.

The contract for supplying the entire electrical apparatus in connection with Vancouver's new street lighting system, has been awarded to the Hinton Electric Company. The standards will be supplied by Messrs. Earle & Company. Each standard is to be equipped with five 75-watt tungsten lamps to operate at 11.3 volts. The transformer which reduces to this low voltage will be installed in the interior of the base of each lamp post.

M. P. Cotton received the contract from the B. C. E. R. for clearing and grading the new line from Burnaby to Vancouver, a distance of 7 1-2 miles. Expenditure, over $150,000.

Three damage actions against the British Columbia Electric Railway, arising out of the accident on the interurban at Lakeview in November last, resulting in fourteen persons being killed, have reached trial. The first was brought by the widow of T. E. Slayton. The company did not deny liability. The jury assessed the damages at fourteen thousand dollars. In the action of the widow of T. E. Turtle, the judge, without a jury, gave eight thousand dollars damages. The jury awarded J. D. Taylor, for the wreck of his nervous system, fifteen thousand dollars.

Vernon, B.C.

A company in which Vancouver capital will be largely represented is now being formed for the purpose of establishing a large electric lighting and power plant in the upper Okanagan valley. It is stated that plans have been so far matured that incorporation of the company will be completed at an early date. The principal business of the new company will be the construction and operation of lines of electric railway which, acording to present plans, will radiate from the town of Vernon.

Victoria, B.C.

B. C. E. R. is planning to create a big summer resort at Cordova Bay, where forty acres of land have been purchased.

Tenders addressed to the Minister of Public Works will be received until June 6th for the construction of a transmission line for the carrying of electricity to the Hospital for the Insane at Coquitlam. Plans, etc., at government offices. F. C. Gamble, Public Works Engineer.

Unless some unforseen delay is encountered the B. C. Electric Railway Company's big power plant at Jordan river will be completed and connected with the city early next year.

Wellington, B.C.

B. C. E. R. is contemplating the construction of an aerial tramway to connect its Lone Star mines with its Wellington property. The proposed tramway will be about seven miles in length.

Welland, Ont.

David Dick & Sons, Limited, have the contract for the building 150 miles of Hydro-Electric line from St. Thomas to Berlin, and Ingersoll to London.

The town of Welland will vote on June 30th on the question of granting a franchise to build and operate a street railway. Part of the railway is to be in operation in about a year. Power will also be asked to spend $50,000 in installing a fire alarm system.

Winnipeg, Man.

Telegraph rates in and out of Winnipeg are to be investigated by the Railway Commission as soon as possible. The action is the result of a request from the Winnipeg Board of Trade and several other public bodies in the West, which complained that unjust discrimination against the West is practised by the telegraph companies, the C. P. R. telegraph being the chief sinner on account of its extent and wide connections.

Residents in the municipality of St. Francois Xavier are endeavoring to induce the street railway company to extend the Headingly lines a distance of ten miles. They state that there are already enough people in the district in close proximity to the proposed extension to make the construction and operation of the road profitable, and that with the construction there would be a large and immediate increase. Manager Phillips, of the street railway company, is looking over the district and the farmers' request will receive careful consideration.

Engineer Chace, in charge of the installation of the municipal power plant and transmisison lines, has suggested the temporary erection of overhead conduit so that the city may be served as soon as power is ready. The undergronnd cables cannot be in place for some time.

M. Peterson, secretary, Board of Control, sends us the following items. Contracts have been awarded as follows: Section A.—Comprising three 50-light regulators and control panels, also one hundred arc lamps, 6.6 ampere magnetite system, Canadian General Electric Company, Winnipeg, at $9,190. Section B.—Insulated line wire and cable, The Northern Electric and Manufacturing Company, Winnipeg, at $2,010.75. Section C.—Mast Arm Parts, The Northern Electric and Manufacturing Company, Winnipeg, at $258.21. Section D.—Six-panel Switchboard, instruments, etc., The Canadian General Electric Company, Winnipeg, at $3,450.

A site has been purchased adjoining the police station on Rupert street on which a central station for the city fire alarm system will be erected.

Work has commenced on the establishing of an underground system of trunk cables to connect the diffeernt Winnipeg telephone exchanges.

Yorkton, Sask.

The town council is considering the installation of an electric light plant at a cost of $24,000.

The town council is considering the installation of an electric light plant at a cost of $24,000. W. E. Skinner, Limited, of Winnipeg, is preparing the plans.

City Secretary-Treasurer is authority for the statement that the question of constructing municipal electric light plant has been discussed, but nothing further has been done.

Fully qualified Electrical and Mechanical Engineer, 11 years practical experience in the construction and management of Steam and Hydro Electric Power undertakings, including latest English, Italian and Canadian practice, is open to accept position as Assistant, or General Superintendent Engineer in connection with existing or new developement schemes. Only positions of responsibility considered. Highest Credentials and References. Address Box 987 ELECTRICAL NEWS, TORONTO, ONT. 6

For Sale

One, 25 K. W. 125 volt Westinghouse D. C. Generator, 1 switch board complete, nineteen A and B 6.6 arc lamps alternating current, seventeen mast arms, fourteen automatic cut outs, 1 arc regulator, 1 Switchboard switches complete, all in good condition, offers received for lot or items, delivery in thirty days. Address Secretary Treasurer Town of High River Alberta.

6 E. H. MACK.

Canadian Agents Wanted

Responsible jobbing firm wanted to take the agency for electric heating utensils for household use. Address, EXCEL ELECTRIC HEATING CO., 52 Lawrence Street, Newark, N. J. 6

Agents Wanted

Wanted — Responsible manufacturers agents and salesmen to handle a well established line of electrical measuring instruments. Box 977, ELECTRICAL NEWS, Toronto, Ont. 6

Leading firm of British telephone manufacturers are open to appoint sole purchasing agent for Montreal and Toronto. Only first-class, well established firms capable of buying large quantities of telephone apparatus, electric bells, etc., need apply. "Telephone" care of GORDEN & GOTCH, St Bride Street, London Eng. 8

Wanted

Alternating Current Generator, Second Hand, 3 phase, 2000 volt, 7200 alternations, 75 to 125 K. W., belt driven. Give full particulars as to condition, size of pulleys etc.

L. HARSTONE,
Secretary Board of W. L. and H. Commissioners
St. Mary's, Ontario
6

Canadian Agents Wanted

Manufacturers of British made electric motors and dynamos want established houses to represent them in all Canadian cities. Specialities, continuous current motors and dynamos, 1/8 H.P. to 600 H.P. 2 and 3 phase motors 1/4 to 100 H.P. 1 phase motors 1/4 to 10 H.P.

WRIGHT & WOOD, Limited,
Halifax, England.
6

For Sale

1—Corliss Engine, 13" x 30", made by the Laurie Engine Co. in first class condition, can now be seen running.

1—Compound Duplex Pump, 10" x 18" x 12", 600 galons per min. 50 rev. built by the Kerr Engine Co., now in use.

1—Generator Switch Board, marble panel, complete with oil switches and long scale instruments, 2200 volts, 60 cycles, Westinghouse make.

The above will be displaced by Niagara Power.

L. HARSTONE,
Secretary Board of W. L. and H. Commissioners
St. Mary's, Ontario
6

For Sale

Together or Separately

3—Return tubular boilers, each 78" diameter by 18 feet long.

92—Tubes, 4" diameter by 18 feet long.

1—Tandem Compound McEwen Engine left hand. Cylinders 19 and 32" x 24" stroke, capable of developing 600 indicated Horse Power when cut off at 3/8 stroke with an initial steam pressure of 125 lbs. in steam chest and running condensing.

Piping Valves Feed Pump Injector
Steam Trap Heaters (2) Condensor

1—3 phase, 2300-2400 Volt, 60 cycle Generator and exciters and switchboard equipment. Capacity of Generator 400 K. W. with necessary belting etc., apply

DOMINION POWER & TRANSMISSION
CO., Limited
Hamilton, Ont. 6

Patent Notice

Any one desiring to obtain the Cipher Message Converting and Checking Apparatus, covered by Canadian Patent 112334, granted on June 9th, 1908 to H. C. Newton and A. G. M. Mitchell, of Melbourne, Victoria, Australia or the Cipher System covered by Canadian patent 111966 granted on May 19th, 1908 to H. C. Newton and A. G. M. Mitchell, aforesaid, may do so upon application to the undersigned, who are prepared to supply all reasonable demands on the part of the public for the inventions. FETHERSTONHAUGH & Co., 5 Elgin St. Ottawa, Canada. RUSSELL S. SMART, resident. 6

Recent Trade Publications

Our Leaders.—Pamphlet issued by the Canadian General Electric Company, Toronto, describing the "Columbia" dry cell for telephones and the "Red Top" Columbia Ignitor.

General Electric Company.—Schenectady, Letters Nos. 146 and 147, calling attention to this company's standard lamp sockets and to an improved standard conduit box receptacle.

High Speed Trucks.—Catalogue issued by the J. G. Brill Company, Philadelphia, setting forth the various points of excellence in the construction of the various parts of the Brill High Speed Car Trucks.

The A. B. Regenerative Flame Arc Lamp.—Bulletin No. 87, by the Adams Bagnall Electric Company, Cleveland. An illustrated description of this company's flame-arc lamp, calling attention to various recent improvements in its construction and efficiency.

Metz-Price Protective Gear.—An explanation with diagrams of the Metz-Price system of instantaneous isolation of any section of a high tension transmission line in case of faults in that section. Issued by A. Reyrolle & Company, Limited, Hebburn-on-Tyne.

Electrical Apparatus for the Steel and Iron Industries.—A 130 page book, well illustrated, explaining the development of electrical apparatus in recent years and particularly in its application to the steel and iron industries. A final chapter is given to low pressure turbines.

Candelabra and Canopy Switches.—A folder issued by the Cutler-Hammer Manufacturing Company, Milwaukee. An explanation of the construction and some of the applications of a very compact and ingeniously arranged circuit switch specially designed for candelabra lamps.

Carborundum and Electrite.—Booklet issued by the Vincit Company, London, Eng., describing the manufacture and qualities of these two hard substances and the various uses to which they are put by this company in wheels, grinding machines of various forms, files, oil stones, etc. Complete price list appended.

MOONLIGHT SCHEDULE FOR JUNE

(Courtesy of the National Carbon Company, Cleveland, Ohio.

Date.	Light.	Date.	Extinguish.	No. of Hours
June 1	7 50	June 2	3 10	7 20
2	7 50	3	3 40	7 50
3	7 50	4	3 40	7 50
4	7 50	5	3 40	7 50
5	7 50	6	3 40	7 50
6	7 50	7	3 40	7 50
7	7 50	8	3 40	7 50
8	7 50	9	3 40	7 50
9	7 50	10	3 40	7 50
10	8 00	11	3 40	7 40
11	8 00	12	3 40	7 40
12	10 30	13	3 40	5 10
13	11 00	14	3 40	4 40
14	11 20	15	3 40	4 20
15	11 40	16	3 40	4 00
17	0 00	17	3 40	3 40
18	0 20	18	3 40	3 20
19	0 50	19	3 40	2 50
20	1 20	20	3 40	2 20
21	No Light	21	No Light	
22	" "	22	" "	
23	8 00	23	10 20	2 20
24	8 00	24	11 00	3 00
25	8 00	25	11 40	3 40
26	8 00	26	0 20	4 20
27	8 00	28	0 50	4 50
28	8 00	29	1 10	5 10
29	8 00	30	1 40	5 40
30	8 00	July 1	2 00	6 00

Total 150 40

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PRESCOT, ENGLAND

Capital $7,300,000.00

WORKS: Prescot, Helsby and Liverpool, England

British Insulated & Helsby Cables
Limited

Contractors to **H. M. Government, War Office, Admiralty,** also to the Principal Corporations in the British Isles and Abroad for Electric, Traction, Power, Lighting, Telephone and Telegraph Equipments. Also Manufacturers of Paper, Lead Covered, Rubber, Gutta-Percha and Bitumen Insulated Cables; Flexible Cord, Cotton Covered Wires, etc., etc. Also Junction Boxes, Section Pillars, Overhead Tramway Gear, Bonds, Switchboards, Meters, Telephone Instruments, Exchange Equipments, Batteries, Insulators, Fire Alarm and Police Equipments, Railway Signals, Blocks, etc., etc.

Canadian Representatives:

CANADIAN BRITISH INSULATED COMPANY, Limited

Cablegrams: "Insulator" Montreal
Phone: Main 1521, Montreal

Power Building, MONTREAL

Where the Electrical Convention Meets

Something about Muskoka, Nature's Lavish Handiwork—The Land of Clear Skies; Beautiful Islands and Fertile Plains; Laughing Streams and Rushing Torrents

The words, "All aboard for Muskoka,'' is a call which each season sends a thrill of delightful anticipation through thousands, who, having perfected their plans, are ready to depart for that greatest of all Canada's playgrounds. If you wish to view Nature's most lavish handiwork, Muskoka is a constellation of her wildest prodigalities. All are here—fertile plains, peaceful villages, rugged rock-ribbed ridges, a wilderness of forests, laughing streams, rushing torrents over precipitous declivities of sparkling lakes nestling on their bosoms hundreds of island gems rivalling Mirza's entrancing vision of Paradise. If you wish rest from the brain fag of business, or the exhausting demands of city social life, Muskoka will supply your wants—clear skies, rarified atmosphere, healthy climate, placid waters where sunny days may be dreamed away in a dainty canoe, glistening stretches of sandy beach where one may disport himself in limpid waters, lovers' paths through the fragrant wood or mountainous rocks to be climbed. Here are peaceful country homes, cozy island cottages or the villas of the affluent, modest hotels or popular resorts where the fashionable and wealthy congregate. The word "Muskoka'' is derived from the name of the great chief of the Hurons, "Musaquado,'' signifying "clear sky,'' and the district well merits its name. Situated 1,000 feet above sea level, its altitude produces a modifying effect on the sun's brightness, and the climatic conditions are most enjoyable. Muskoka is a district. This means it has not as yet been given the conventional form of municipal government, but is directly under the control of the Provincial Legislature, thereby presenting the charm of an unsettled territory, while at the same time its many towns and villages afford the conveniences of more thickly settled localities, such as postal telegraph, telephone and railway service, etc. This district, to which the general term of "The Highlands of Ontario'' has been popularly applied, is one of many hundred square miles in extent. It lies on the eastern shore of the Georgian Bay between the middle tier of counties of Simcoe, York and Victoria on the south and the District of Parry Sound on the north. In general formation the same roughness which characterizes the great Laurentian range, of which it forms a part, is to be observed. It is thickly wooded with stately pines, giant hemlocks, fragrant balsams and wide-spreading maples. In fact every variety of tree life is found to grow here in glorious profusion. It is dotted with hundreds of pretty lakes of all sizes and depths, the greatest and most beautiful of which is the group called The Muskoka Lakes, namely, Lakes Muskoka, Rosseau and Joseph.

The lakes are fed by several rivers and streams, chief among them being the Muskoka River, entering Muskoka Lake about midway between Muskoka Wharf and Beaumaris, on the eastern shore of the lake, and the route of the Muskoka Navigation Company's steamers to Bracebridge, a pretty town, eleven miles north from Gravenhurst. The Dee River, connecting Three-Mile Lake with Lake Rosseau, near Windermere, Skeleton River from Skeleton Lake to Lake Rosseau, and Rosseau River, with the pretty Rosseau Falls, all feed this, the second largest of three lakes, on its eastern boundary, while Shadow River, one of Nature's gems, at the head of the lake, will alone repay the tourist for the entire journey up the lakes. Two other notable streams, dear to the heart of the sportsman and the intrepid canoeist, are the Moon and the Muskosh rivers, the outlet of the lakes from Muskoka Lake at Bala, which flow into the Georgian Bay to the west.

The Muskoka Lakes contain between four hundred and five hundred islands of every shape and size, ranging from one of over 1,100 acres, in Lake Rosseau, to those containing but a single tree, or a rock rising sheer from the water's edge. The most numerous, however, are densely covered with pine, balsam, cedar, birch, maple, oak and other varieties of tree life. Many of the islands, on which have been erected handsome dwellings, are the private property of wealthy Americans and Canadians, but there are hundreds of choice little spots on which any party is at liberty to take up their abode for the season.

How to Reach the ''Royal Muskoka.''

By many times the most delightful route by which the 'Royal Muskoka'' may be reached lies by way of Muskoka Wharf at Gravenhurst, which is easy of access from north, east, south and west by rail. From this point the journey is completed by water.

''Muskoka, all change!'' shouts the conductor as the Express comes to a standstill within a few feet of the trim steamers of the Muskoka Navigation Company awaiting our arrival. But a few moments are required to transfer luggage, the cables are loosed, and you swing out on your voyage through fairyland. The shores of the mainland widen and become distant, but other shores rise up around you, of islands little and big, near and far, rocky or covered with luxuriant green to the edge of the blue water, and the only sign of human life is here and there a red peak among the trees, or a tiny pier and boathouse at the edge. Island folds back on island, in innumerable shades of rich sunlit green, every larger one with two or three smaller tucked away in the pocket of its blue skirt, till the distant ones, veiled in mist, blend with the sky; island on island, from the large tract of many wooded acres to the stubborn little rock thrusting up its brown head with one rugged storm-beaten pine.

After on hour's sail through this fairyland the boat glides into the narrow channel of the Indian River, and Port Carling is reached. At this point the steamer goes into a lock and is raised to the level of Lake Rosseau. But a short time is here lost, and we soon emerge into beautiful Lake Rosseau and the same labyrinth of beautifully wooden islands greets the eye. Finally, we round a picturesque point and the ''Royal Muskoka,'' the Convention Headquarters, comes into view.

The romantic and beautiful situation of the ''Royal Muskoka,'' its spacious and graceful proportions, the interesting history of its erection, all tend to inspire anticipations of the pleasantest sort, as its picturesque red towers, gleaming through the varied green of the trees, first meet the eye of the visitor to the far-famed lovely ''Highlands of Ontario.'' Hitherto the visit to these charming waterways and enchanted islands, with their ravishing vistas and air so pure and delicious, has been marred for the enthusiastic summer traveller hotels of this healthful district. The very fact that thousands of visitors yearly have put up with this for such a length of time, of itself speaks unmistakably for the fascination, beauty and healthfulness of Muskoka.

ROYAL MUSKOKA WOODS

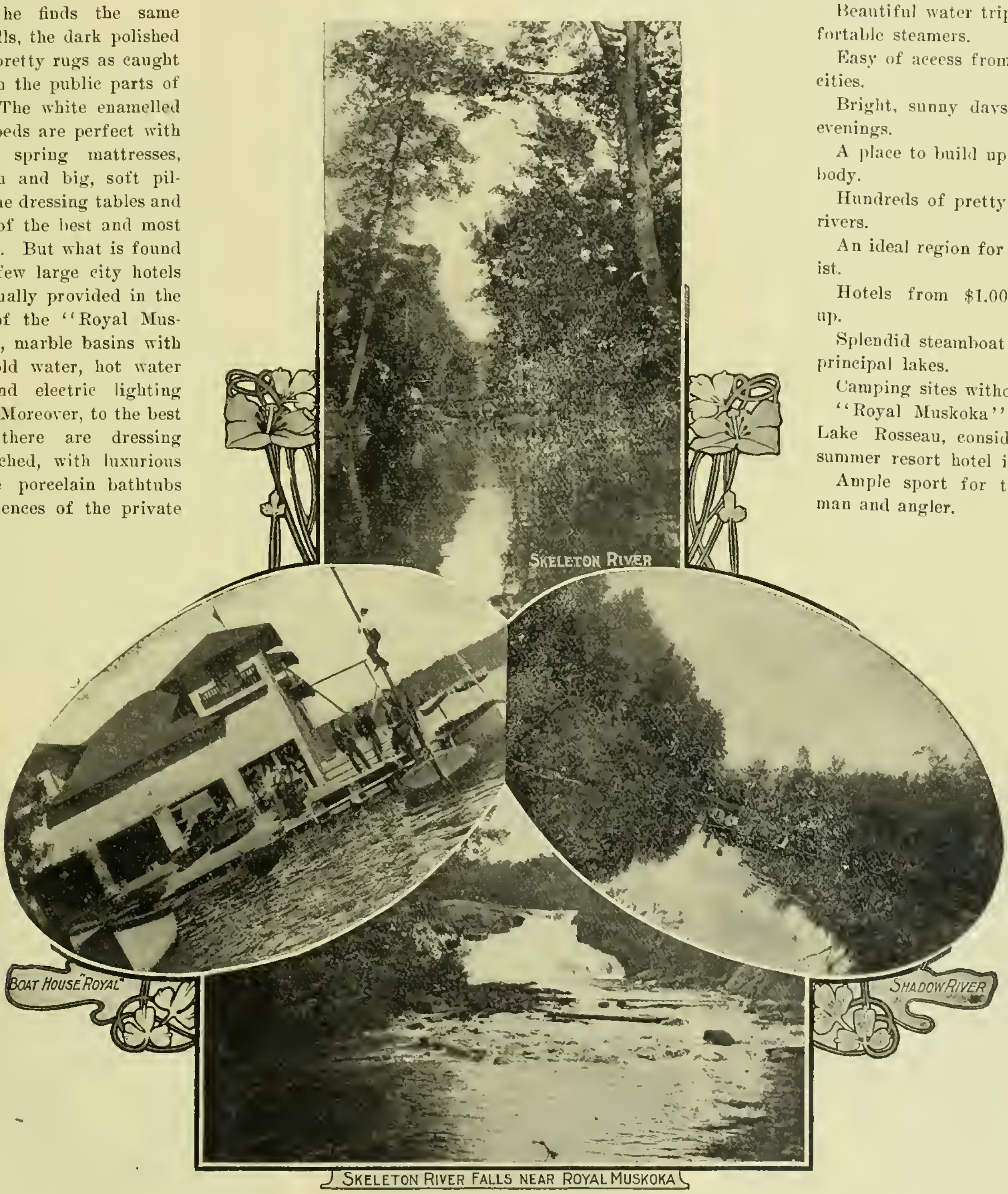
THE TENNIS COURT

M.L.A. REGATTA

ON THE GOLF LINKS

The first pleasant impression made by the ''Royal Muskoka'' upon travellers sailing up the lake is deepened upon the nearer approach of the boat to the island. One notes with pleasure the soft gray stucco walls, timbered across with dark wood, under its red-tiled roof; the deep, cool verandah—where luxuriously comfortable chairs of every description invite to rest—and command views the loveliest, the most ravishing, the eye can look upon, “Summer isles of Eden lying in dark purple spheres of sea.” The blissful quiet, broken only by the rustling of the beeches and the soft sigh of the pines—for not the least attraction of Muskoka is its seeming remoteness from the noisy traffic and din of cities—fall upon the tired spirit like balm. Even the winding walk up the hill under the trees to the hotel is of noiseless, soft brown tanbark, so that no clatter of many feet coming and going breaks the delightful charm of Nature's music. All is beauty, quiet; and a new sense of life is soon felt as one drinks in the pure, bracing air that is so apparent to the newcomer.

Nor when the visitor is shown to his rooms are his pleasant impressions in any way decreased. On the contrary they are heightened, for he finds the same tasteful walls, the dark polished floors and pretty rugs as caught his fancy in the public parts of the hotel. The white enamelled and brass beds are perfect with their best spring mattresses, snowy linen and big, soft pillows, and the dressing tables and chairs are of the best and most appropriate. But what is found in a very few large city hotels even is actually provided in the bedrooms of the “Royal Muskoka,” viz., marble basins with hot and cold water, hot water heating, and electric lighting and bells. Moreover, to the best bedrooms there are dressing rooms attached, with luxurious large white porcelain bathtubs the conveniences of the private home. The plumbing is all open and the ventilation of the best; indeed, it is quite evident that the sanitary conditions of the “Royal Muskoka' have been made a first consideration with the management.


SKELETON RIVER

BOAT HOUSE "ROYAL"

SHADOW RIVER

SKELETON RIVER FALLS NEAR ROYAL MUSKOKA

The walks in and about the grounds of the “Royal Muskoka” are many and charming, and the lover of solitude has no difficulty in finding the most exquisite spots in these fragrant woods in which to dream away the time or read in quiet. For the more socially inclined there are the great wide-winged, air-swept, shady verandahs, with their superb command of the loveliest views, and for all there are sports—canoeing, bathing, fishing, golfing, tennis and water trips up and down the lakes. A week here does wonders for the visitor in the matter of health, but a month or longer actually recreates him, so marvellous, so health-giving is the air of this Muskoka district.

The prominent features of Muskoka may be summed up,—

One thousand feet above sea level.

Perfect immunity from hay fever assured.

Good hotel accommodation with moderate rates.

Finest summer resort region in America.

Beautiful water trips on comfortable steamers.

Easy of access from principal cities.

Bright, sunny days and cool evenings.

A place to build up mind and body.

Hundreds of pretty lakes and rivers.

An ideal region for the canoeist.

Hotels from $1.00 per day up.

Splendid steamboat service on principal lakes.

Camping sites without a peer.

“Royal Muskoka” Hotel on Lake Rosseau, considered best summer resort hotel in Canada.

Ample sport for the sportsman and angler.

The fishing grounds are many and good.

Malaria-breeding swamps are unknown.

Mail and express service to all points twice daily.

Telegraph and telephone service at many of the principal points.

For sportsmen and campers, singly or in parties, hunting or fishing expeditions, one hundred and fifty pounds of baggage and camping outfits will be checked free of charge on each full ticket.

Programme C. E. A. Convention

WEDNESDAY, JULY 6TH.

9.30 a.m.—Opening Remarks; Minutes; Secretary-Treasurer's Report; Auditors' Report; Correspondence; Report of Membership Committee; General Business.

10.30 a.m.—Paper: "Power Contracts," W. N. Ryerson, Great Northern Power Company.

Paper: "The Commercial Agent and the Community," C. A. Littlefield, New York Edison Company.

2.30 p.m.—Paper: "The R. C. M. Electric Service Rate System," S. Bingham Hood, Toronto Electric Light Company.

Paper: "The Residential Lighting Field; How it can be Profitably Cultivated," A. T. Holbrook, New York.

Report of Committee on "Uniform Accounting."

Report of Committee on "Central Station Statistics."

4.00 p.m.—Canoe Races, Tilting Contests, Golf, etc.

8.00 p.m.—Informal Reception and Dance.

THURSDAY, JULY 7TH.

9.30 a.m.—Paper: "Accessories Which Tend to Continuity of Power Supply," A. S. Loizeaux, Baltimore, Md.

Paper: "Notes on Transmission Line Regulation," Mr. Paul M. Lincoln, Westinghouse Electric & Manufacturing Company.

Report of Committee on Standardization of Line Construction.

Report of Committee on Grounding of Transformer Secondaries.

2.00 p.m.—Meeting of Executive Section, i.e., all representatives of private companies.

4.00 p.m.—Baseball Match, Manufacturers versus Operating Companies.

7.00 p.m.—Banquet for Members and Guests.

FRIDAY, JULY 8TH.

9.30 p.m.—Paper: "How to Increase the Station Load," Sidney G. Redway, Toronto Electric Light Company.

Paper: "Electric Heating and Cooking Appliances," Harold S. Brown, Canadian General Electric Company.

Report of Committee on Installation, Care and Testing of Meters.

Report of Committee on "Conservation of Natural Resources."

2.00 p.m.—Paper: "The Attitude of the Central Station Manager towards Illuminating Engineering," R. E. Scott, National Electric Lamp Association.

Paper: "Tungsten Street Lighting, with Special Reference to 25 Cycle Circuits," C. L. Stephens, Pittsburg.

Paper: "The Diesel Oil Engine," Mr. F. A. Yerbury, Toronto.

Naming of Standing Committees.

Next Place of Meeting.

Unfinished Business.

8.00 p.m.—Informal Concert and Dance.

The new conduit tube being installed by the Ontario Power Company at Niagara Falls will be equivalent in size to the original 18 foot diameter tube, but will not be circular in cross section. It will be oblate in shape, the horizontal axis being 19 feet 3 inches and the vertical axis 16 feet 6 inches, giving an area of 254.5 square feet. Conduit tube No. 1 was built of steel plates riveted together and with a concrete envelope about the exterior. The tube now being installed will be constructed of concrete, reinforced with steel, and will be the largest tube ever attempted in this material. This tube will carry sufficient water to generate from 70 to 80 thousand horse-power and will bring the Ontario Power Company's capacity up to about 150,000 h.p.

W. N. Ryerson
President Canadian Electrical Association

A. L. Mudge
Chairman Paper Committee

W. L. Adams
Chairman Convention Committee

Electrical News
Generation, Transmission and Application of Electricity

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ADVERTISEMENTS.

Orders for advertising should reach the office of publication not later than the 20th day of the month preceding date of issue. Changes in advertisements will be made whenever desired, without cost to the advertiser.

SUBSCRIPTIONS.

The "Electrical News" will be mailed to subscribers in Canada and Great Britain, post free, for $1.00 per annum. United States and foreign, $2.00. Remit by currency, registered letter, or postal order payable to Hugh C. MacLean, Limited.

Subscribers are requested to promptly notify the publishers of failure or delay in delivery of paper.

EDITOR'S ANNOUNCEMENT.

Correspondence is invited upon all topics coming legitimately within the scope of this journal. Subscribers can materially assist by sending in news items and information regarding electrical development in all parts of Canada.

Vol. 19 Toronto, July, 1910 No. 7

University Course in Illuminating Engineering

The importance that illuminating engineering, as a science, is assuming in the United States is shown by the recent announcement by the Johns Hopkins University, of Baltimore, that this university offers for the academic year 1910-1911 a course of thirty-six lectures on the science and art of illuminating engineering. The objects of the course are set forth to be (1) to indicate the proper co-ordination of those arts and sciences which constitute illuminating engineering; (2) to furnish a condensed outline of study suitable for elaboration into an undergraduate course for introduction into the curricula of undergraduate technical schools; and (3) to give practicing engineers an opportunity to obtain a conception of the science of illuminating engineering as a whole. This action, on the part of the university, has been taken at the instance of the Illuminating Engineering Society, of New York, which has been instrumental in arranging the course of lectures. Consequently the lectures are given under the joint auspices of this society and of the university. That the course is intended to take an important place on the university curriculum is shown both by the scope of the lecture topics and by the names of the lecturers, which include many of the best known practical scientists in the United States.

It is to be hoped this course of lectures will be printed and widely distributed, for the promise of results from such a movement would seem to be almost as great as the demand. The study of illumination as a theory only, has too long remained such on the university curriculum, while its value in artistic effect, where recognized at all in the past, has chiefly been developed at the expense of both science and efficiency. There is possibly no other phase of the electric industry possessing such great possibilities for the development of the aesthetic in our nature, as effective and artistic lighting installations. A combination of scientific, efficient and artistic illumination is, let us hope, a consummation of the near future.

Report of Commission of Conservation

We are just in receipt of the first annual report of the Commission of Conservation which is, in effect, the report of the first annual meeting of this Commission held in Ottawa in January last. It will be remembered that this Commission, created in May, 1909, is composed, ex-officio, of the Minister of Agriculture, the Minister of the Interior, the Minister of Mines, the member of each provincial government who is charged with the administration of the natural resources of his province, and in addition twenty members to be appointed by the Governor-in-Council. The full Commission now is composed of 32 members, with Hon. Clifford Sifton chairman, and Mr. James White, secretary.

The proceedings of the first meeting consisted chiefly in the presentation of a number of papers on conservation topics by representative Canadians and in the formation of seven committees, each of which will have special supervision over one particular section of our natural resources. The committees a little later during the session presented reports.

The committee which is of particular interest to an electrical journal is that on "water and water powers," of which the members are: Mr. F. D. Monk (chairman), Hon. Jules Allard, Hon. Frank Cochrane, Hon. Price Ellison, Hon. W. C. H. Grimmer, Mr. C. A. McCool. The report of this committee, which was adopted, recommended to the government as follows:

"That steps be taken to obtain and tabulate complete information of the waterways of Canada so far as available information goes, and, wherever practicable, that such information be supplemented by examination and inspection.

"That this information comprise statements of the development of powers which have taken place, their scope and the market therefor, the amounts used by the public and the rates charged.

"That for the use of the committee on public health, information should also be collected showing how and to what extent the watercourses are being contaminated by drainage.

"That the Commission should be resolution, declare that, in its opinion there should be, in future, no unconditional titles given to water powers, but that every grant or lease of powers should be subject to the following, among other, conditions:

"1. Development within a specified time.

"2. Public control of rates.

"3. A rental with the power to revise same at later period."

The conservation of the water powers of Ontario was discussed at length by the Hon. Adam Beck, Chairman of the Hydro-Electric Power Commission for Ontario, who outlined in turn the origin, scope, progress, effect and probable future of the Commission. This paper has already been dealt with in previous issues of the ELECTRICAL NEWS, and contained, in effect, an organized recapitulation of all the information which had previously been given out from time to time.

Another paper of great interest was presented by Mr. Charles R. Coutlee, C.E., engineer-in-charge of the Ottawa storage survey, on the subject, "the water wealth of Canada, with special reference to the Ottawa river basin." A general review of Canada under the sub-heads, Pacific Coast, Central British Columbia, MacKenzie basin, Lake Winnipeg basin, St. Lawrence basin, New Brunswick and Nova Scotia, is first given, with reference to the power, irrigation, navigation, drainage and domestic supply in each section. The Ottawa basin is finally discussed at greater length. The drainage area is given as 56,000 square miles, and the average flow of the Ottawa river during 60 years is placed at

55,000 cubic feet per second. It is pointed out that in the past only 10,000 c. f. s. could be depended upon, as this represented the minimum winter flow. The storage policy of the Dominion Government is then outlined, by which it is proposed to place storage dams below the Temiskaming, Kepawa and Quinge-Expanse Lakes, and by which means it is hoped to maintain the full flow of 55,000 c. f. s. the year round. The building of the great Chaudiere dam at Ottawa (described in our June issue), as a result of this policy is noted, and Mr. Coutlee ends with a glowing picture of the power possibilities throughout the whole area between Labrador on the east and Fort William on the west, and foresees the Ottawa valley, at the end of the present century, as the ''power heart of the world and the centre of a delightful district unsullied by coal smoke and beautified by reservoirs of unrivalled natural beauty.''

It is scarcely possible to over-estimate the value of this public spirited and able body of men acting in an advisory capacity to the government of the day. Each member of a committee will, in the nature of things, become more or less of a specialist in his particular sphere. The continuity of service during the pleasure of the appointees will insure a continuous interest in, and study of, our natural resources which should gradually tend towards the reduction of unnecessary waste. Further than this, and perhaps most important of all, this Commission will always, as it has already done, act as a nucleus in time of need around which all the forces in sympathy with the preservation of our resources for our own people will assemble. There can be no doubt that the people of Canada recognize gratefully the assistance that this Commission has already rendered and we shall look hopefully for still greater and more varied services in the years to come.

Sir Henry's Offer

It is sincerely to be hoped that the offer of the Toronto Electric Light Company to the city of Toronto, by which unnecessary duplication in electrical distribution may be avoided, will be fruitful of results. That duplication will practically double the initial expenditure is evident. That any permanent reduction in rates beyond what a properly controlled merger would produce is impossible. If competition is persisted in it is morally certain that the private corporation can quote at least as low rates as the city, and it must be remembered, too, that the private company already has a well established lucrative business from which it will take something more substantial than sentiment to deprive them. It is true that at least one of the cities in the electrical area has, through one of its aldermen, openly voiced the probability of having to sell under cost for a time. But we venture to say that no municipality dare carry such a policy into effect,—a policy which would tax the non-users of electricity, the big majority, to supply cheap light and power to the fortunate minority.

We are strongly of opinion that Toronto, and any other city or town where similar conditions of competition exist, will be well advised in abandoning this dream of rate-cutting and will accept the first business-like arrangement that offers, to relieve themselves of an obligation conceived, in many cases, in haste and to which, often, they committed themselves in the heat of resentment at the apparent unreasonableness or arrogance of some too liberally franchised private company.

Water Powers in Quebec

The report of the Minister of Lands and Forests, Quebec, for the year ending June 30, 1909, is just to hand, and contains reports of certain water powers on the Saguenay and Batiscan rivers, northern tributaries of the St. Lawrence and on the Grand Bostonnias river, a tributary of the St. Maurice. The Saguenay rises in Lake St. Chicontimi, some 30 miles down the river. The river is here described as a succession of falls and rapids, aggregating a total drop of about 70 feet. The volume of water as measured gave 30,000 feet per second and the total low water power available is given as 235,000 h.p. These falls are not spoken of as being favorable for economical development.

The Batiscan is a much smaller river, having at ordinary low water a discharge of 500 or 600 cubic feet per second. The falls examined were located near St. Genevieve. They would be easily developed and have a minimum of 9,000 h.p.

The water fall described on the Grand Bostonnais is 2 1-2 miles from the Quebec & Lake St. John Railway. The fall is estimated at 26 feet, easily capable of increase to 36 feet. The flow is comparatively small, but under modern conditions of engineering about 1,200 to 1,600 h.p. could be developed.

An Official Testing Laboratory

In our June issue we called the attention of our readers to the possibilities for evil in allowing to be placed on the market any form of industrial electrical apparatus that would not stand the test of competent inspection, and pointed out the necessity of the government taking steps to establish an official testing laboratory. We are in receipt of a communication from Professor Herdt of McGill University, which we print below, and which shows that this University has already recognized the necessity for such a laboratory and that they have striven at McGill to render, in an unofficial way, whatever assistance they have been able in the cause of efficiency and safety. In the same manner Toronto University has for years placed its laboratories and its professors at the disposal of any who may care to make tests, and it is doubtless well known that the University authorities here have openly expressed their willingness to assist in supervising any tests that may be required either by firms or individuals.

This being the case,—that the universities are already splendidly equipped and very willing to assist in the matter—it would appear that it only remains for the governments to take action and make these tests compulsory and *official*. Professor Herdt's letter reads as follows:

The Editor,
CANADIAN ELECTRICAL NEWS.

Dear Sir,—

I have read with interest an editorial in your issue of June on the necessity of a properly equipped testing laboratory where electrical apparatus could be tested and inspected.

It may not be out of place for me to state that the Electrical Department of McGill University has a laboratory equipped for such work as you mention. The standardization and inspection of a large amount of electrical machinery, apparatus and instruments has been carried out in this laboratory for some years. It is true that our inspection is unofficial, but we believe from the work carried out that it has been a great help to electrical companies and manufacturers who have taken advantage of it.

Very truly yours,
(Signed) L. A. HERDT.

Correct Size of Generating Units

We are pleased to be able to give our readers in the present issue a splendid article on the subject, "Limitations in Size of Hydro-Electric Generating Units,'' by Mr. Imlay, superintendent of the Niagara Falls Power Company. Mr. Imlay's experience as superintendent of the largest group of operating hydro-electric generating plants in America, and probably, indeed, in the world, producing approximately 175,000 h.p., gives his opinions the greatest weight. It is well to remember, too, that the units under Mr. Imlay's charge vary all the way in size from 5,000 h.p. up to 15,000 h.p.

We are no doubt inclined, in America, in our eagerness to do business on an ever-increasing scale, to look forward to the days when twenty, twenty-five and thirty thousand horse-power units shall be common, but the article discourages this view, except under unusual conditions, and very carefully discusses the questions of expenses, efficiency, etc., as the author in his experience has found them. The necessity for preserving a high factor of safety, which means maintaining a reserve equal to the largest unit, is in itself a very strong argument against the excessively large and expensive units.

Owen Sound Uses Electricity to Advertise

Owen Sound has installed a scheme of lighting which, although primarily conceived from an advertising standpoint, now produces such a satisfactory illumination effect that the system is being extended. The present installation consists of 20 arches of iron tubing stretched across the main street every 35 yards. Each cable carries twenty-one 8 candle power, 35 watt, 200 volt, carbon lamps, which are suspended 24 inches apart. As the distribution voltage in Owen Sound is 600 volts, the lamps are arranged three in series. The cost of the arches, including lamps and everything complete, was $20 each. The cost of operation is placed at 4 cents per arch per hour, which is calculated to include repairs, renewals and all expenses in connection with the same. In accordance with their scheme of advertising the town, these arches are lighted every night from 8 to 10 o'clock, and Saturday night until 12 o'clock. Ten more arches will be erected immediately. Reeve T. W. Thomson, who is chairman of the light and power committee, is responsible for much of the success of this novel installation.

New Hamburg Alterations and Additions

The citizens of New Hamburg recently voted to purchase the light and power plant at present owned by Mr. Morley, for $8,000, and are already taking steps to have the necessary alterations and additions made in the power house, so that they may be able to utilize the 250 horse-power of Niagara power contracted for with the Hydro-Electric Commission, which, it is expected, will be on hand about September 1. The additions and extensions will also cost in the neighborhood of $8,000.

The present generator is a steam driven 80 h.p. United Electric single phase 2,200 volt machine, which may be retained for the present, in which case a small motor will be installed to operate it which will use Niagara 2,200 volt, 3 phase current. The transformers to be installed will probably consist of three 100 k.w. 13,200/2,200 volts. The present street lighting system, which is part arc, part carbon incandescent, will be replaced by a tungsten series system regulated through a constant current transformer. The changes are being supervised by E. B. Merrill, consulting engineer, Toronto.

Canadian Gas Association Convention

Mr. Alvan Woolf, a representative of the Canadian Tungsten Lamp Company, Hamilton, attended the convention of the Canadian Gas Association, recently held in that city, and informs us that even the Gas Association finds itself unable to do without electricity in that this form of energy was used to ignite the large gas arcs with which the hall was illuminated. Mr. Woolf states, however, that in the matter of cooking devices gas has electricity beaten, as yet, in economy of operation, cost of installation, and time required to manipulate.

We are inclined to differ with these statements with the exception perhaps of cost of operation, and this is a matter which is rapidly being met by cheaper rates and more efficient appliances. To offset the cost, however, it must be taken into account that electricity is safer, cleaner, and infinitely more healthy, to say nothing of the fact that it adjusts itself more readily to the little luxuries of life.

Siemens Bros. Dynamo Works, Limited

The statement was recently made by the management of the Siemens Bros. Dynamo Works, of London, England, that the number of employees of this company, in all parts of the world, now exceeds 60,000. Such an extensive establishment certainly indicates both excellence of management and of manufactured products. The aggressive policy of extension which many of the European continental factories are following during the last year or two, together with the excellent prospects in the Canadian market for goods of established reputation, has been the means of drawing many representatives of European firms to Canada and, among others, the Siemens Bros. saw fit some months ago to open an office in Toronto. The increase in this company's sales during the past year has apparently shown the wisdom of this move, for the Siemens products have been placed at various points throughout the Dominion, the customers including Dawson City, Port Arthur, Ontario Hydro-Electric Power Commission, Nova Scotia Steel & Coal Company, and the A. & E. Read Company, Newfoundland.

The international nature of the concern is also shown by the following list of high tension plants at present under construction: Aix les Thermes, France, 55,000 volts; Bogoslowsk, Russia, 22,000 volts; Lamigo, Italy, 60,000 volts; Fuji Suiden K. K., Japan, 22,000 volts; Guadalajara, Mexico, 70,000 volts; Molinar, Spain, 66,000 volts; Mariazell, Austria, 30,000 volts; Salto Bolarque-Madrid, Spain, 50,000 volts.

The Canadian manager, Mr. Arthur S. Herbert, returned to Toronto recently from a trip to Europe, where he has been arranging various matters connected with the organization of his branch. Mr. Herbert states that the electrical manufacturers, both in England and on the continent, are extremely busy at present and that their own works are quite filled with orders —their export business, particularly, having shown a great increase during the last year. He says that it is the general opinion, both in England and on the continent, that the Canadian market is one of the best in the whole world and that the German manufacturers especially are looking this way now that the 33 1-3 per cent. surtax has been removed. The tariff dispute between the Dominion and the United States also attracted a great deal of attention and, in England, everybody was very pleased to see that Canada came out on top. Regarding the tariff reform movement in England, he believes that within the next few years we shall see England with a protective tariff with a large preferential tariff within the Empire. At the same time, it is a point to be well carried in mind that the total yearly trading in England, in spite of her small population, still greatly exceeds that of any other nation in the world and is always on the increase.

Mr. Herbert also says that the European manufacturers complain very much about the short time allowed for tendering on Canadian requirements, and that it does not appear that the Canadian buyers realize that on large contracts where head office must be consulted, the outside firms require at least three weeks longer than Canadian firms. This is a question that has already been discussed at length in these pages and one upon which there can be little difference of opinion. If competition in tendering is of any value, then the more competition the better. Short time calls are, in most cases, both unbusinesslike and unjust to the client whose money is being spent.

Power Developement at St. Alban, on Ste. Anne River

A small but very interesting power development is under way at St. Alban, on the Ste. Anne river, for the Deschambault Electric Company. At the dam site the stream flows between two perpendicular limestone walls only 38 feet apart. In this narrow gorge a reinforced concrete dam will be built creating a reservoir 3 miles long from which a surplus of water may be drawn during the low water periods at the time of maximum load. The flow of Ste. Anne river with a normal head of 50 feet, will justify the development of 1,500 kilowatts divided between 3 units. For the present two units only will be installed. The power house, a stone construction, will be situated close to the dam, the steel flumes from the forebay to the turbines being only about 25 feet long. The 3 phase 60 cycle current will be raised from 2,000 to 25,000 volts and distributed in seven or eight villages within a radius of

15 miles. The contract for the dam has just been awarded to R. C. Argall Company, of Montreal, for $31,300. Mr. J. F. Guay is consulting engineer-in-charge for the Deschambault Company.

The Fort Frances Matter Settled

The Order-in-Council recently passed at Ottawa, respecting the export of electrical power in Fort Frances, reads in part as follows,—that the granting of a license, to the Ontario & Minnesota Power Company, Limited, of Fort Frances, Ontario, to export electrical energy to the extent of two thousand six hundred and eleven (2,611) kilowatts, approximately three thousand five hundred (3,500) horse-power, be made subject to the conditions that said license be revocable at will and also to the further conditions mentioned on the draft form of license submitted herewith.

The citizens of Fort Frances by this arrangement will have from 2,000 to 3,000 h.p. ready for their immediate use. Mr. Bachus will also probably have sufficient to carry along his projects on the United States side of the river.

Beaverton Light & Power Company

The Beaverton Light & Power Company, James Dobson, manager, has just completed a new power house about 35 x 50 feet, and will install a 160 h.p. 3 cylinder producer gas plant to be supplied by the Canadian Producer & Gas Engine Company, of Barrie. The generator is to be 100 k.w., 2,200 volt, 3 phase, 60 cycle, Westinghouse type. The switchboard is also being supplied by the Westinghouse firm.

The market for this power will include a 50 h.p. motor to be installed for the Beaverton Brick & Tile Company, situated about 2 miles from the generator; a 25 h.p. motor for Donald Gunn's dairy farm; seven small motors, ranging from 1-2 h.p. to 7 1-2 h.p., at various points in the town; and the lighting of Ethel Park, where 180 lights are already installed. In the near future it is Mr. Dobson's intention also to operate his peat plant by electric power. The plant will probably be in operation during July.

Peterboro Light & Power Company Extensions

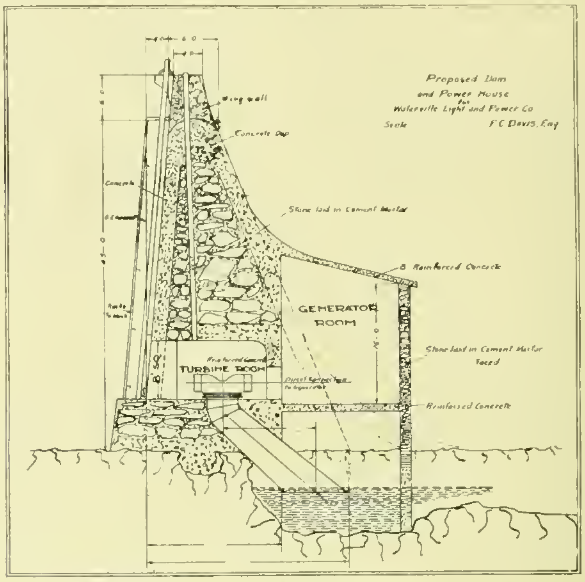
The water rights at the Auburn dam on the Otonabee river, which flows through the city of Peterboro, have been recently acquired by the Peterboro Light & Power Company, and will be developed immediately. The dam is situated within the city limits, about a mile and a half from the post-office, and is midway between the old power installation of the Quaker Oats Company and the proposed development of the Canadian General Electric Company. At this point there is a fall of 18 feet. The power installation will consist of four 500 k.w. generators, three of which will be installed as soon as the power house is ready, the fourth as the demand requires. The construction of the plant will be under the supervision of Smith, Kerry & Chace, electrical engineers, Toronto. Work is to commence at once and will be completed with this firm's usual expeditiousness.

Packard Company Filling Large Orders

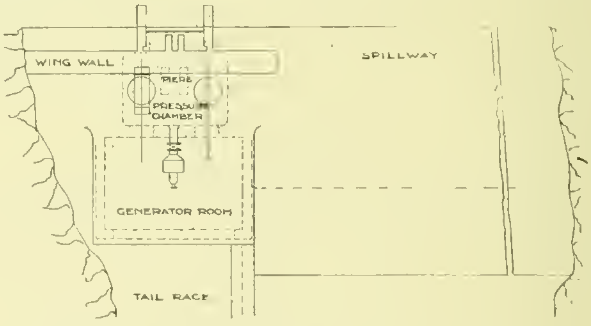
The Packard Electric Company, Limited, have during the past three years supplied some of the largest transformer installations for industrial plants in the Niagara power district. All these transformers are subject to very severe services, in some cases conditions demanding continuous operation with heavy overloads. That they are able to meet the demands made upon them is evidence that the Packard Company's design, construction and method of insulation are such as to recommend their type of transformer to intending purchasers of power. The more recent nistallations include seven 750 k.w. transformers for the Electro Metals, Limited, Welland, Ont., and for the American Cyanimid Company, of Niagara Falls, Ont., fourteen transformers in all, made up of seven 800 k.w., four 165 k.w., and three 85 k.w. units. The government elevator at Port Colborne installed three 350 k.w.; the Dain Manufacturing Company, of Welland, one 150 k.w.; the Ontario Iron & Steel, one 1,200 k.w., and Norton Company, of Niagara Falls, one 135 k.w. transformer. Smaller installations at various points total about 25,000 h.p.

A Unique Power Plant at Waterville

In our last issue we made mention of a small power development at Waterville, Quebec, and now reproduce two drawings showing the plan of this interesting installation. It will be seen that the water dam is constructed with a room in its base for the turbines, which are direct connected to the generators, the generator room being of cement and built so close to the dam as also to be almost a part of it. The main dam is 45 feet in height and with 8-foot draft tubes will give an effective head of about 50 feet.



Vertical Section Waterville Power Plant.



Horizontal Section Waterville Power Plant.

The plant will consist of two 450 h.p., 600 r.p.m. turbines, direct connected to 3-phase 60-cycle 2,200-volt generators. One exciter unit will supply both generators, the exciter turbine being fed through an 18 inch gate. The installation is planned to be in operation by November 1 of the present year. Fred. C. Davis, of Coaticook, is the electrical engineer in charge.

Electrical Lighting and Pumping for Longueuil

The town of Longueuil, a municipality lying a little to the east of Montreal and on the south shore of the St. Lawrence river, has decided to make extensive improvements and additions to the local pumping plant and also to install a modern street lighting system. Messrs. Ross & Holgate have been retained as designing and supervising engineers, and already several important contracts have been let so that the work of construction will be proceeded with at once.

A series tungsten street lighting system, the first of its kind to be adopted in this district, will be installed by the Canadian General Electric Company, together with two 8 kilowatt constant current transformers for control of lighting system. This company has also the contract for a receiving and recording panel for the motors and lighting. From 425 to 150 street fixtures will be installed.

To improve the municipal fire and domestic service, a contract has been awarded to the Structural Steel Company of Longue Point, who will erect an 80,000 gallon water tank. Two 50 horse-power vertical motors, set over the main suction well, will be attached to six inch turbine pumps capable of delivering 800 imperial gallons per minute. This equipment and the necessary piping will be supplied by the John McDougall Caledonian Iron Works Company. One 80 horse-power Maxim boiler as a stand by for fire pump service will be installed and will be used as an auxiliary to the electric pump, Mr. R. F. Ogilvy being the successful tenderer.

The electric power requirements will be supplied by the Montreal Heat & Power Company, who are also erecting the street line work for the town. The present council of Longueuil have worked faithfully to improve the town and are to be congratulated in having at last succeeded in placing the installation of an up-to-date lighting and pumping plant under way. Messrs. St. Mars, Ste. Marie and Maille are the special committee acting with the engineers on installation. Mr. A. Geoffrion is the popular mayor and Mr. M. Dagenais is secretary-treasurer of the corporation.

The General Electric Company of Sweden

The General Electric Company of Sweden, through their agents, Messrs. Kilmer, Pullen & Burnham, Toronto, report the following recent contracts: With the Seymour Power Company, Campbellford, for one 1,250 k.w., 120 r.p.m., 2 phase, 60 cycle, water-wheel type generator; with the Belmina Consolidated Asbestos Company, of Coleraine, Que., for two 300 h.p., one 75 h.p. and three 10 h.p., 3 phase, 30 cycle induction motors, complete with switchboard equipment and transformers; with Messrs. Joseph Simpson & Sons, Toronto, for their knitting mills, a slow speed steam driven generator unit of 750 h.p.; and with the town of Brockville for one 375 k.w., 60 cycle, 3 phase, 2,200 volt generator, one 140 k.w., 60 cycle generator, and a 6 panel switchboard.

Interesting Experiments on the Carbon Brushes—Valuable Results Indicated by Curves

By A. M. Lindsay.

The d.c. railway motor, especially in city service, is called upon to operate under very arduous conditions, having to carry constantly varying currents with large momentary overloads, the amount of which depends on conditions, such as load, grade, etc. As the brush position is necessarily fixed, a good motor must be able to commutate successfully under this condition at all loads within its capacity with a minimum of sparking. The commutator is the weakest part of the d.c. motor, and a large percentage of railway motor troubles are traceable either to defects in the commutator itself or to failures to successfully commutate heavy currents.

Mechanically considered, the commutator is about as perfect as it is possible to make it, so, during the past two or three years, more attention has been paid to the improvement of the wearing qualities and current carrying capacities of the carbon brushes which make contact with the commutator. There is a very important relation, which is often overlooked, between the mica of the commutator and the carbon brush. Hard mica demands a hard brush or one with sufficient abrasure action to prevent the mica becoming high and causing sparking, resulting in rapid electrical wear of both brushes and commutator, while the same brush on a commutator with soft mica would produce considerable mechanical wear of the copper bars.

Carbon brushes in railway service may be divided into three grades:

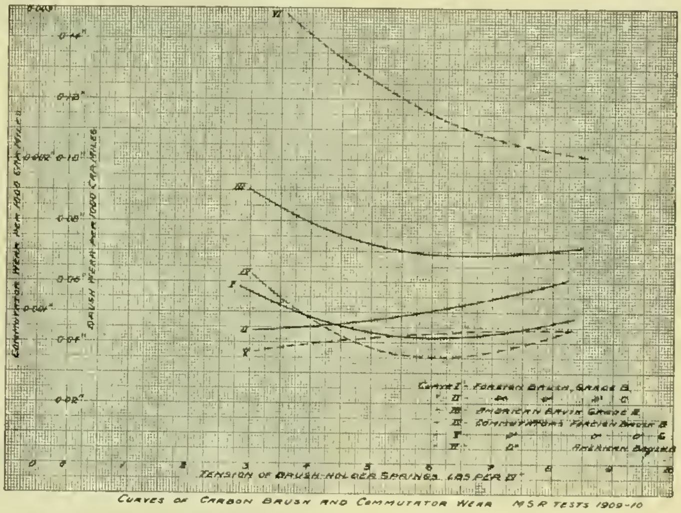
Grade A.—Coke brushes—these brushes have low conductivity and are usually of very variable physical properties. They contain a certain amount of abrasive material which cuts down the mica of the commutator, but which, at the same time, wears away the copper of the commutator bars.

Grade B.—Coke and graphite brushes—harder and more compact than Grade A, and with improved conductivity due to the presence of the graphite.

Grade C.—Graphite brushes—brushes with a very high conductivity, but too soft for use on any but grooved commutators.

The rolling stock department of the Montreal Street Railway has lately concluded a series of comparative tests upon ungrooved commutators with a foreign brush Grade B and an American brush of the same grade. The results are considerably in favor of the foreign brush, as will be seen from the accompanying curves and tables.

The foreign brush gave uniformly satisfactory results throughout the tests, the chief points in its favor as compared with the American brush being—longer life, less wearing action on commutator, more uniform physical properties, smaller percentage of chipped and broken brushes, and lower total cost. The heating effect of the foreign brush was also noticeably less—an important factor in reducing the possibility of motors "bucking."



Curves showing results of tests with carbon brushes

The figures for the costs, as given in the following tables, are based on capital charges only, as the maintenance charges are practically the same in both cases. These tests served also to determine the most satisfactory brush tensions for the different types of motors—Westinghouse 68 and 101, and General Electric 67 and 80—upon which the brushes were tested. As will be seen from the curves this tension lies between 5 and 7 pounds per square inch of brush contact surface.

CARBON BRUSH TESTS.

Type Brush	Average Brush Wear per 1000 car miles	Average Comm. Wear (Diametral) per 1000 car miles	Cost per 1000 car miles Brushes per motor Cents.	Commutator Cents.	Total Cents.
Foreign brush, Grade B.	0.042 in.	0.0010 in.	1.92	4.50	6.42
American brush, Grade B.	0.070 in.	0.0022 in.	1.09	7.58	8.67

AVERAGE LIFE OF BRUSHES.

Car Miles.

Type Motor.	Foreign Brush.	American Brush.
Westinghouse 68	27,000	12,000
Westinghouse 101	20,000	12,500
General Electric 67	20,500	13,000
General Electric 80	23,000	15,000

The Makers of Electrical Canada 2

FREDERIC NICHOLLS—THE CORRELATOR

It is not possible in one word to sum up the characteristics of a life so full of varied activities as that of Mr. Frederick Nicholls has been but a general view of what he has accomplished, a looking backward over the developments which have followed one another in such a logical sequence can lead to one conclusion only, that each move in Frederick Nicholls' industrial activities, though, may be, at the time, and to the casual observer, unrelated, was in reality but one more link in a chain of co-related developments which have resulted in the building up of a united, complete and compact system of manufacture, wholesaler, retailer and consumer. Mr. Nicholls' business career has been a game of chess, not played, however, according to the latest book authority, but following a carefully worked out plan of his own which others did not understand. The onlookers have shaken their heads and said he made a false move. His opponents chuckled within themselves and thought they had him, now. But, unheedingly, quietly, often swiftly he has moved, following ever his own plan, and all see now, what Frederic Nicholls always foresaw, that the issue was never in doubt. And so while there are many admirable words with which one may describe a single phase of the character of the subject of this sketch, our one word, correlator, best expresses his life work and its magnificent results.

Mr. Frederic Nicholls.

In support of this statement one has only to review the different enterprises that, one by one, owe their existence to Mr. Nicholls' intuitive recognition of an unfilled niche in his scheme of co-related enterprises. The Toronto Incandescent Company, to supplement arc lighting; the underground system of distribution to further his incandescent house system; the generation of electric power to supply his lighting system; the manufacture of electrical supplies for use in the generation, distribution and consumption of his electric power; the promotion of street railways for utilization of more power; the Niagara Falls hydro-electric development to supply the growing power requirements; the building of the pioneer high tension transmission system, and finally the organization of the Canada Foundry for the supply of the various forms of metal required in the manufacture, the transmission and the utilization of all this power.

The life history of Frederic Nicholls is too well known to require any extended reference here. Born in England, he early crossed to Canada in search of the wider field for which he was specially adapted. His early connection with politics and journalism and his keen and helpful interest in tariff matters are well remembered facts in Canadian history, and besides are not within the scope of an electrical journal. In electrical matters he will be gratefully remembered as an active pioneer with unbounded faith in electricity and in electrical Canada. He was the means of organizing the first incandescent lighting system in Canada; was keenly interested in the promotion of the first street railway system; was entirely responsible that a Canadian company, the Canadian General Electric, and not a United States company, the Edison General Electric, has held the most prominent place in Canadian electrical manufacturing for the past three decades; has been largely instrumental in the promotion and extension of two of the finest interurban electrical railway systems in the Dominion, the Niagara, St. Catharines and Toronto, serving the Niagara peninsula, and the Toronto and York Radial, serving the area north of Toronto; and finally is chiefly responsible for what is very generally conceded to be the finest hydro-electric development system in the world—the Electric Development Company's plant at Niagara Falls and its subsidiary 85 mile transmission line to Toronto.

In all of these enterprises Mr. Nicholls has been a prominent figure, in addition to which his interest in electrical matters led him to associate himself with other Canadians in the large Sao Paulo consolidation, and later, for a time, with the still greater Rio de Janeiro system. From this latter, however, Mr. Nicholls has recently withdrawn, in keeping, as we understand, with his avowed intention of gradually curtailing his numerous responsibilities and that he may to the fullest extent conserve his physical energies in the interests of purely Canadian work, to which he has always given of his best.

One other characteristic of Frederick Nicholls, for which Canadian people all have reason to rejoice, is his love of the beautiful. He is a lover—and judge—of art. Only one example of many that could be quoted—the external appearance of the electrical development generating plant at Niagara Falls—illustrates the ideal in architecture which Mr. Nicholls has sought to uphold. This building impresses one altogether as an art gallery and not as a factory. Much the same may be said of all the buildings in the construction of which Mr. Nicholls has been interested, which shows not only his belief in art as a national asset but his broader conception of art as something more than mere pictures or books and as something, too, which the general public and not the chosen few only should have access to, and take pleasure in, and reap profit from.

M. S. R. Freight Service in Demand

The efficient service rendered by the Montreal Street Railway Company in supplying their open style gravel cars for the removal of debris from the collapsed Herald Building has been very favorably commented upon. The scarcity of teams left the city authorities wholly unable to cope with the rapidly accumulating piles and they were glad to avail themselves of the railway company's offer of removal. Much of the opposition to the company's freight carrying service will as a result quite possibly be removed.

Varied Applications of Tumbler Switches

Have Long Been Used in England—Lend Themselves to Special Applications—Simplicity and Strength of Movement

Ewart B. Walker

The tumbler switch, which has been for many years the standard of England, lends itself particularly well to a variety of special applications on account of the simplicity and strength of its movement. In addition to the standard patterns, single pole, double pole, three way and four way, a number of special switches have been developed which render almost every conceivable combination possible. The following are a few of the more interesting applications.

"Twinob" Switch.

This switch consists of two single pole tumbler movements placed side by side on one base with one cover making two complete single pole switches into a unit. This arrangement is particularly useful where a variety of combinations of lights is required, such as in large chandeliers, etc., and an idea of its flexibility may be obtained by a glance at Figure 1, where 15 lights are shown connected to two "twinob" switches in such a way that any number of lights can be turned on from one to fifteen.

The switch positions are as follows:

1 light, switch blade No. 1 closed.
2 light, switch blade No. 2 closed.
3 light, switch blades Nos. 1 and 2 closed.
4 light, switch blade No. 3 closed.
5 light, switch blade Nos. 1 and 3 closed.

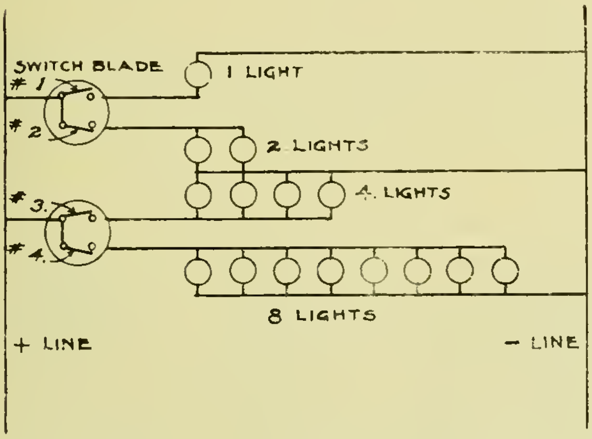


Fig. 1

6 light, switch blade Nos. 2 and 3 closed.
7 light, switch blade Nos. 1, 2 and 3 closed.
8 light, switch blade No. 4 closed.
9 light, switch blades Nos. 4 and 1 closed.
10 light, switch blade Nos. 4 and 2 closed.
11 light, switch blades Nos. 4, 2 and 1 closed.
12 light, switch blades Nos. 4 and 3 closed.
13 light, switch blades Nos. 4, 3 and 1 closed.
14 light, switch blades Nos. 4, 3 and 2 closed.
15 light, switch blades Nos. 4, 3, 2 and 1 closed.

Series Parallel and Off Switch.

This switch is shown in Figs. 2, 3 and 4, where the two lamps A and B are so connected that, with the switch knob down they are in parallel across the line and burn at their full brightness (Fig. 2). With the switch knob in the centre both lights are off (Fig. 3), and with the knob up the two lamps are in series and burn very dimly (Fig. 4). This switch is useful for nurseries, sick rooms, etc., and gives sufficient light in the series position to allow a nurse to inspect her patient without awakening him by too much light. It has a marked advantage over two filament lamps and regulating sockets, as it does not require special lamps and it can be placed at the door or in any other convenient position as far away as may be desirable.

Tripin Three Way Switch.

This switch, shown in Fig. 5, has been developed specially for bedrooms or other places where it is desirable to replace a single pole switch already installed with a three way, without rewiring the room. For example, many bedrooms in old houses are supplied with a single pole switch near the door, which often is not convenient for control from the bed. In this case a "tripin" three way switch should be installed and a three wire cord run from it to the bed, terminating in a three way pendant switch. The wall switch is provided at the side with a three point receptable and plug, so that it can be used with or without the three way extension.

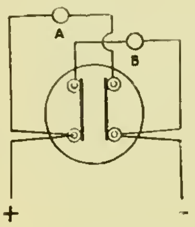


Fig. 2

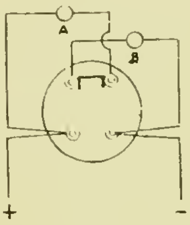


Fig. 3

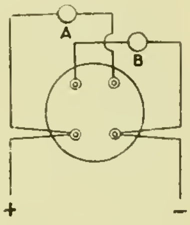


Fig. 4

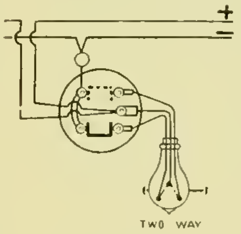


Fig. 5

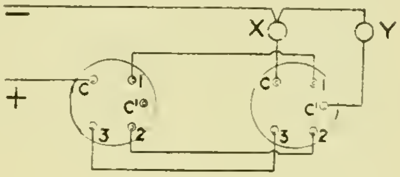


Fig. 6

Marvel Switch.

Perhaps the most interesting combinations can be obtained by the use of the "Marvel" switch, the connections of which are shown in Figs. 6, 7 and 8. Like the series parallel switch, it has three positions, centre, up, and down. There are a dozen or more combinations for which it is adapted, and of these the three following are the most useful:

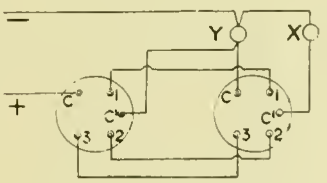


Fig. 7

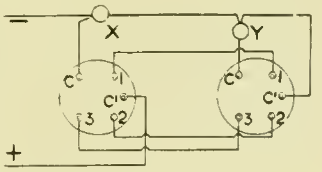


Fig. 8

(1) Either of two lights can be controlled from two positions, as in Fig. 6. For instance, in a hotel bedroom, X could be a light over the dressing table and Y a light by the bed, one switch being placed at the door and one at the bed. The guest is then able to have either light on from either switch, but he cannot burn both

lights at once. Five hundred rooms in the Strand Hotel, London, are so equipped, and the result is that the bedroom lighting bill is nearly halved, while the guests are supplied with all the light that is necessary.

(2) In Fig. 7 is shown an arrangement where all or part of any group of lights can be controlled from two points. This is useful in dining rooms, where a two or three light fixture is often installed, the switches being placed at the hall and kitchen entrances. During the meal all the lights would be on, afterwards the switch would be moved to another position, leaving one light only, which would be sufficient for clearing up, and finally the third position would extinguish all the lights. Any of the combinations, all light, one light, or off, could be secured at either switch independently of the position of the other switch.

(3) Fig 8 shows the series parallel arrangement controlled from two points, and is useful in private hospital wards, where one switch at the bed and the other at the door will allow either nurse or patient to have full light, dim, or off.

Aluminium for Electrical Conductors

Interesting Table of Comparative Physical Properties —Useful Deductions — Varied Uses of Aluminium

By Roderick J. Parke

In view of the enormous increase in the use of aluminum for electrical conductors, and the large saving to be effected by their adoption as compared with the cost of copper lines, readers of the Electrical News will doubtless be glad to have before them some information in a concise form, showing the relative characteristics and commercial efficiency of the two metals, with some special reference to the advantages of aluminium.

The following table sets forth a comparison of the relative physical properties of the two metals, namely

Physical Property.	Aluminum.	Copper.
Specific gravity	2.68	8.94
Conductivity (Matthiessen Standard)	60 to 62 p.c.	97 to 100 p.c.
Ultimate strength per sq. in.. lbs.	23,000 to 36,000	23,000 to 55,000
Cross Section, on basis of equal conductivity	1.56	1.00
Diameter (equal conductivity)	1.26	1.00
Weight for equal conductivity	48.	100.
Tensile strength for equal conductivity	75 to 125	100.
Co-efficient of linear expansion per degree F.	.00000128	.00000095
Co-efficient of lineal expansion per degree C.	.0000231	.0000171
Thermal conductivity (watts through 1 cu. in. temperature gradient 1 degree C.	36.5	8.7
Resistance per Centimeter cube at zero C (Michrohms)	2.60	1.626

From the above table of characteristics the following useful facts are demonstrable:

1. On the basis of equal carrying capacity, the weight of the aluminum transmission line is 48 per cent., or less than half that of the copper, notwithstanding that the cross section is 50 per cent. greater and the diameter 26 per cent. more.

2. The sag of an aluminum line will be slightly greater with rise of temperature than is that of the equivalent copper. but owing ing to the weight of the aluminum being less than half of copper the former can be strung with much less sag, so that at extreme rise of temperature the sag of both aluminum and copper would be practically the same.

3. The load upon the supporting structure, such as poles or towers, is less than half that of the copper. On the other hand, on account of the diameter of the aluminum line being practically one fourth greater than the copper, more resistance is offered to the wind, but as in the calculation of transmission line structures, the factor which is given chief consideration is the strain which is the resultant of two forces acting at right angles to each other, namely, wind pressure acting horizontally and weight acting vertically, it is interesting to know whether under such conditions a greater pull is imposed upon the pins and supports by the copper line or by aluminum line of the same carrying capacity. In this latitude the highest wind velocity observed at that height above ground which corresponds to the average height of a transmission line conductor, is sixty-five miles per hour, which at this velocity exerts a pressure of 10.5 lbs. per square foot of exposed surface of conductor. Under these maximum conditions the greater weight of the copper makes the resultant strain upon the line greater than that of the aluminum, notwithstanding the larger diameter of the latter, but this rule applies only on all conductors larger than No. 2 B. & S. gauge aluminium. Thus for No. 4/0 B. & S. gauge copper the resultant is .79 lbs. per foot of conductor, while for the aluminium equivalent (335,000 c. m.), the resultant is only .645 lbs. per foot of cable. In other words, on a span 200 feet long a 4/0 stranded copper conductor would be subject to a pull of about 158 lbs., while an aluminum conductor of the same conductivity, namely, 355,000 c.m., would be subject to a resultant strain of about 129 lbs.

4. With reference to relative cost of aluminum and copper transmission lines, a comparison made on the basis of copper at 15 cents per pound would indicate that to cost the same the aluminum should be paid for at the rate of 32 cents per pound. The present price of aluminum conductors, however, is about 25 cents per pound, hence aluminum lines are to-day about 22 per cent. cheaper than copper. In other words, if a copper line were to cost $10,000 an aluminum line of the same carrying capacity could be purchased to-day for $7,800. Thus a great saving is shown in capital investment.

As to the relative durability of copper and aluminum lines, the fact that many thousands of miles of bare and insulated aluminum conductors have been in daily use in transmission lines for over fifteen years, distributing the output of some of the largest and most important power plants in the world, and are giving excellent satisfaction, no doubt can now be entertained as to the reliability of aluminum as a conductor for general transmission line service.

For bus bars and very heavy mains for carrying large currents, aluminum is coming into general use in Europe and America. Owing to the greater diameter and cross section comparatively higher current density per square inch is permissible for aluminum, while the saving in weight is a distinct advantage.

The Electrical Construction Company, of Vancouver, has been awarded the contract for the electrical fittings in the new addition to the C. P. R. Empress Hotel, Victoria. The company is also doing the electrical work in connection with the new lighting system on Douglas street. where 86 standards bearing five-light clusters, "a la Seattle," will adorn the thoroughfare. Hutchenson Bros., Victoria, are supplying the standards. In Vancouver the company has secured the contract for wiring the new eight storey Pacific office building at the corner of Howe and Hastings street, the illumination of which will be very elaborate. Herbert C. Mass, electrical engineer, of Seattle, is laying out the specifications and is in full charge of the work.

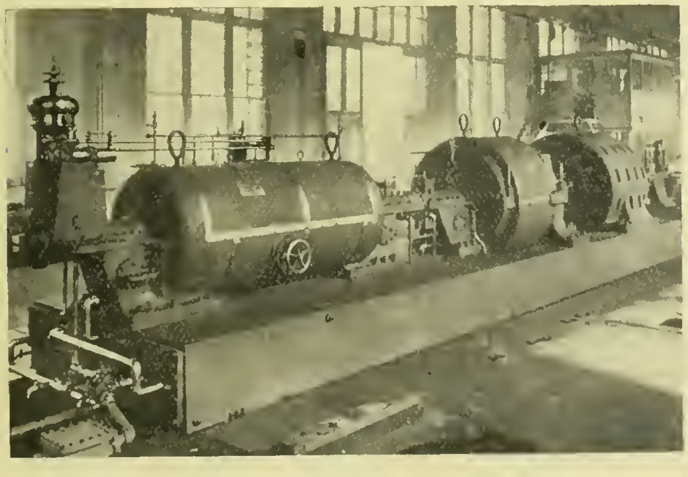
Atmospheric or Low Pressure Turbines

Much Energy Wasted in Ordinary Exhaust Steam—Non-condensing Engines Doubled in Capacity—Non-condensing plus Turbine an Ideal Combination

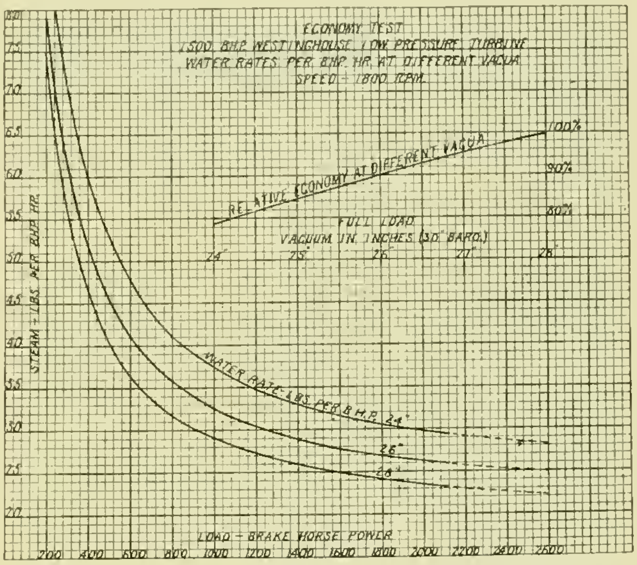
By J. A. MacMurchy

When we speak of a low pressure turbine we usually mean a turbine which receives steam at about atmospheric pressure and exhausts into a relatively high vacuum, this being about the only respect in which it differs from the ordinary steam turbine, which is frequently referred to as a high pressure, or complete expansion turbine. The turbine we are most familiar with receives steam at ordinary boiler pressure and may operate, non-condensing or exhaust, into a vacuum as high as obtainable. It is not essential that a low pressure turbine receive steam at atmospheric pressure, as it may operate with a pressure difference of from ten or fifteen pounds gauge to 26 inch or 27 inch vacuum, or even from a partial vacuum to a greater vacuum. For instance, the steamer "Otaki" of the New Zealand Shipping Company was equipped with two triple expansion engines driving the wing propellers and a low pressure turbine driving the centre propeller, the ship being equipped with three screws. In this case the triple expansion engines delivered steam to the turbine at eight pounds absolute, the turbine expanding the steam from this pressure to a high vacuum. With this pressure distribution the turbine developed one-third of the total horse-power of the propelling machinery. In most cases, however, the steam is admitted at about atmospheric pressure, and for this reason an attempt was made to fasten upon it the name "Atmospheric Pressure" turbine, but the public persisted in calling it a "Low Pressure" turbine and the name has probably come to stay.

Parsons designed a low pressure turbine in the eighties, and some nine or ten years ago Professor Rateau built a turbine to run on the exhaust steam from reciprocating engines, and during 1901 and 1902 the Westinghouse Machine Company of Pittsburgh built quite a number of turbines, each consisting of a high pressure element and a low pressure element, as illustrated in Fig. 1. The high pressure element received steam at boiler pressure and exhausted to a receiver at about atmospheric pressure. The low pressure element received its steam from this receiver and exhausted into a condenser maintaining a high vacuum. All of these turbines are still running and giving excellent results, but it has since been found unnecessary to separate the high and low pressure element of a single turbine, and we merely mention it to show that low pressure turbines were built on this continent several years ago. In fact, the low pressure element of these compound turbines has the identical characteristics of the present high pressure turbine, and careful tests by the builders show the same economical performance. Curves showing the results of tests of a 1,000 k.w. low pressure turbine under various vacua are shown in Fig. 2. It is interesting to note in this connection that although the designers knew at that time of their striking economy yet, as occurs with the introduction of most new applications, it was not until several years had elapsed that they were able to convince steam users that the use of low pressure turbines in connection with their reciprocating engines would result in greatly improved economy.



Two cylinder turbine, low pressure element of which is practically the same as now used to develop power with exhaust steam. Fig. 1.



Curves showing results of economy tests on a 1000 k. w. low pressure turbine at various vacua. Fig. 2.

The proportion of the available energy in steam and below atmospheric pressure is illustrated in Fig 3. From this it will be seen that there is almost as much available energy below atmospheric pressure as there is above it. This has been known since the subject of thermodynamics was first propounded, but it did not attract much attention at first, as there was no engine which could efficiently extract the energy from the steam much below atmospheric pressure. The reason for this will be understood when it is remembered that the volume of one pound of steam at 28 inch vacuum is about one hundred and twenty-two times that at 150-lb. gauge pressure and, as is well known, the ratio of expansion provided for in compound engines is seldom one-eighth of this amount. Greater ratios are impracticable as extraordinarily large cylinders would be required, which by the increase in friction and by the losses due to condensation and re-evaporation would more than offset the gain. We therefore find that compound engines had been exhausting to condensers at about six or eight pounds absolute, while between this pressure and 28 inch or 29 inch vacuum a large percentage of the expansive energy of the steam is still available, but can hardly be made use of in the average steam engine. That this energy can be converted into work by a turbine is forcibly exemplified in the New Zealand Steamship Company's ship referred to above. It may be stated here that this company built two sister ships, the one equipped with twin screws and quadruple expansion engines, and the other with triple expansion engines and a low pressure turbine in the manner previously described. The turbine was so much more able to effectively expand the steam that the ship equipped with the quadruple expansion engines, used, when running at the same speed, approximately 15 per cent. more fuel than the ship which had triple expansion engines and the low pressure turbine. In this connection it might be noted that the turbine machine *per se* is not a much more efficient piece of apparatus than is the reciprocating machine, but generally speaking the turbine's greater efficiency is due to the fact that it expands the steam more efficiently at low pressures. It might be inferred from the above that it is not applicable for non-condensing operation, and while the matter of the design of the turbines to operate non-condensing is foreign to the purpose of this article, yet in order that we may not be misunderstood it should be stated that steam turbines are designed and built for non-condensing operation, which are more economical in steam consumption than many reciprocating engines. At the same time the economic advantages of the turbine is most marked in the case of those designed to operate at high vacuum.

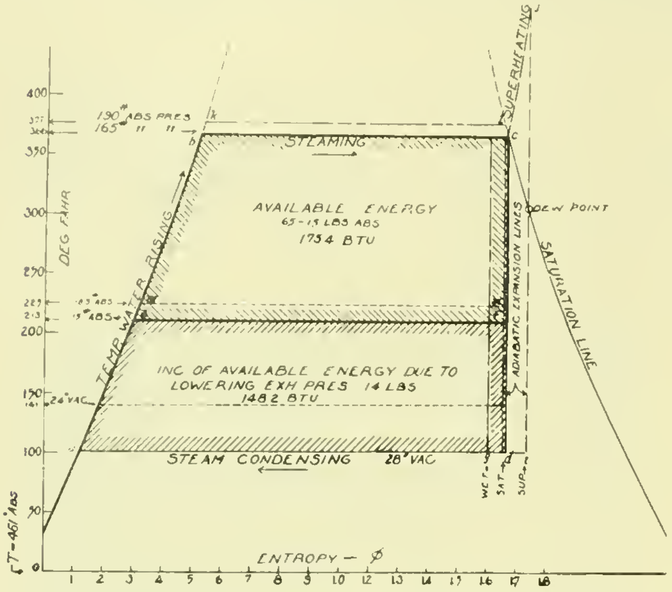
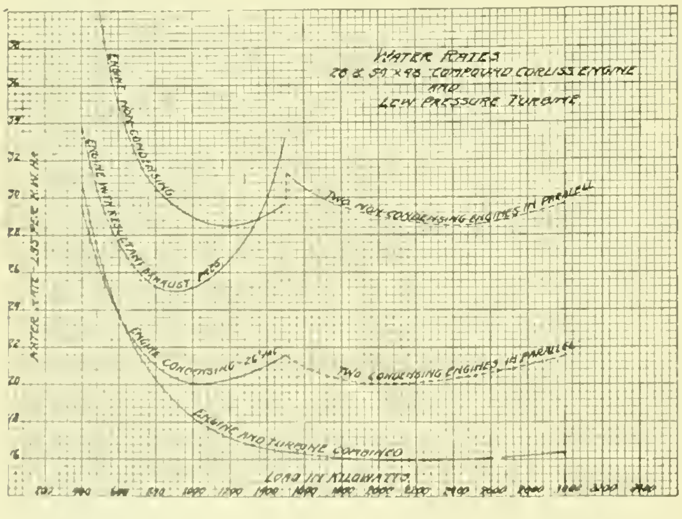


Diagram illustrating the relative amount of available energy between 150 lb. gauge pressure and atmospheric pressure and between atmospheric pressure and 28 in. vacuum. Fig. 3.

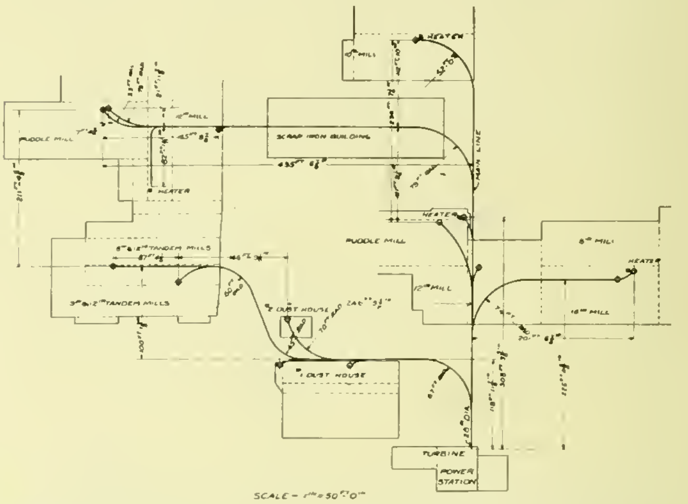


Curves illustrating water rates of a 28 and 51 x 48 Corliss engine operating (1) non-condensing and (2) condensing plus low pressure turbine. Fig. 1.

Again, there are many thousand engines operating non-condensing, in which cases all the energy of the steam below the line of atmospheric pressure is wasted. This is common practice in steel mills, where usually the engines are large and consequently the loss is very great. There is also a large amount of steam available at atmospheric pressure in plants where there are many steam hammers, compressors, punches, etc., one industrial plant at Pittsburgh having enough exhaust steam from these tools to drive a 1,000 k.w. turbine which now furnishes all their electric power. In many cases non-condensing engines were installed because of the difficulty of obtaining sufficient cooling water for the condensers, but the gain from the use of low pressure turbines is much more than sufficient to justify the expense of cooling towers.

Steam turbines can convert into work a very high percentage of the energy of this steam below atmospheric pressure, and are virtually as efficient when working between 27 inch and 28 inch vacuum as between 1 inch and 2 inch vacuum. There is no difficulty in providing blade passages large enough to pass the enormous volume of steam at low exhaust pressures and maintain at the same time relatively low exit velocity. Thermodynamically speaking, the low pressure turbine is more efficient than the high pressure turbine, and moreover, is simpler in construction. This is essentially true of the double flow, reaction type of low pressure turbine, which so efficiently uses the large volumes of steam at the low pressures.

Where the generators are tied together electrically, a governor is not required for the turbine, its speed being controlled by the engine governor. In these cases a safety stop only is supplied. For independent operation a governor is manifestly required, and on account of the heavy valves, the steam admission is usually controlled through an oil operated relay. A secondary valve is also provided so that, if there should be an insufficient supply of low pressure steam, live steam may be admitted to the turbine to make up the deficiency. In some cases the live steam is admitted through a separate set of nozzles, and it is then known as a mixed pressure turbine.



Piping system for low pressure turbine installation. Fig. 5.

Plants using non-condensing reciprocating engines may be increased in capacity about 100 per cent. by the use of low pressure turbines and this without increasing the amount of coal burned and without spending any more money for boilers or stacks or for increasing the size of the boiler house. Usually the turbine can be installed without enlarging the engine room, as the space occupied is very small. In the case of plants using condensing engines the gain is not so great, but it is quite sufficient to justify the addition of low pressure turbines if an increase in capacity and improved economy is wanted.

The combination of a good reciprocating engine and a turbine is probably more economical in steam consumption than any other form of prime mover, but when the investment and operating costs and space occupied is considered the choice would doubtless be in favor of a high pressure turbine installation in the case of a new plant. However, in many an existing plant the addition of low pressure turbines will not only provide additional power, but will at the same time better the overall efficiencies 20 per cent. to 25 per cent. The improvement in the American Steel Company is illustrated in the curves shown in Fig. 4.

A very interesting instance of a low pressure turbine installation is shown in Fig. 5. Here steam at atmospheric pressure has been collected from quite widely scattered sources. It will be noticed that there is here about 2,500 linear feet of piping varying in diameter from 5 to 28. This being an unusual installation, it is worthy to note that the cost of power is only about $5.50 per electrical horse-power per year. This includes all operating expenses and 11.5 per cent. for fixed charges [interest 5 per cent., taxes and insurance 1.5 per cent., depreciation (sinking fund 16 2-3 years at 5 per cent.), 4 per cent., repairs 1 per cent.], and is the more remarkable for the fact that the average load is only about three-fourths of full load, the unit in this case being about 1,000 k.w. capacity. The plant illustrated is that of the American Iron & Steel Manufacturing Company, Lebanon, Pa.

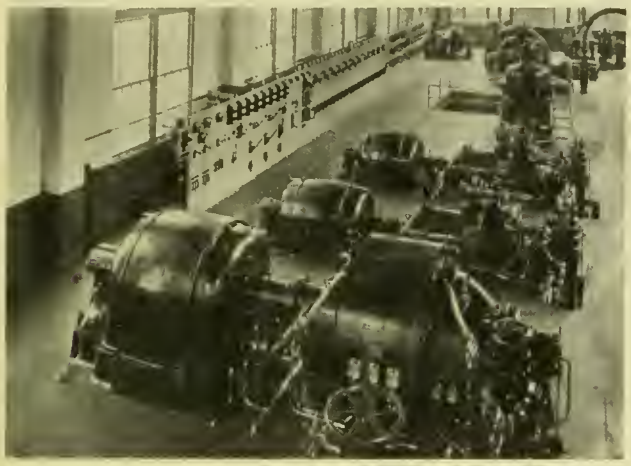

1000 k. w. low pressure turbine; two 500 k. w. horizontal high pressure and one 500 vertical high pressure turbine in background. Fig. 6.

Fig. 6 shows a turbine plant consisting of a 1,000 k.w. low pressure unit in the foreground, back of it are two 500 k.w. high pressure units, and still further back a vertical high pressure turbine. The low pressure turbine gets all its steam from the exhaust of steam hammers, pumps and air compressors.

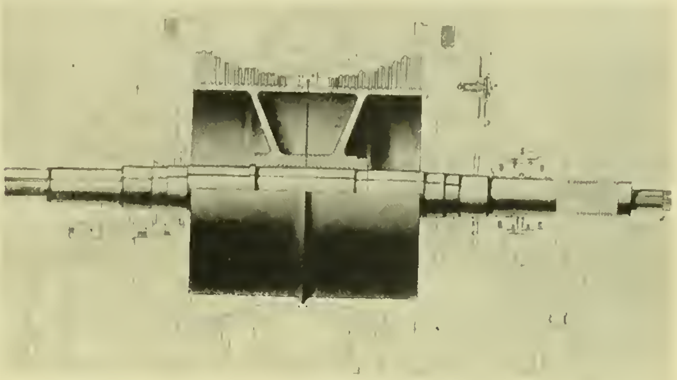

Section through a typical low pressure turbine of the re-action type. Fig. 7.

Fig. 7 shows a section through a typical low pressure turbine of the reaction type.

Where low pressure turbines are operated with the exhaust steam from rolling mill engines a difficulty arises due to the intermittent operation of the engine. This may be overcome by the use of a regenerator, which consists of a large tank partly filled with water, which will absorb heat from the steam when there is an excess and give up steam when the supply becomes less than the demands of the turbine and there is a slight drop in pressure.

Westmount Incinerator and Power Plant

Garbage used as Fuel in Municipal Undertaking—An Economical System of Generating Electric Light and Power

By Geo. W. Thompson

The electric lighting station and plant of the City of Westmount, Que., is one of the recent successful installations that is worthy of special attention in virtue of the unique features in electrical practice that are embodied in its design. In the Westmount station, electrical energy is generated by burning of municipal refuse in a destructor directly connected to a battery of boilers which in turn supply steam to electrical units. The use of refuse destructors in conjunction with electrical stations, while a recognized English and Continental practice for some time, has practically had its first Canadian trial in the Westmount plant.

Construction of Plant.

Towards the end of 1904 the municipality decided upon the erection of a combined garbage destructor and electrical lighting plant. In reaching this decision they were assisted by the acute necessity of dealing with the combined problems of proper garbage disposal and local lighting problems. At this time Messrs. Ross & Holgate, Montreal, were appointed designing and supervising engineers. Ground was broken on the site of the plant in September, 1905, and the first current supplies in April, 1906; construction work was completed in December, when the arc lighting plant was placed in operation to light the city of Westmount streets. During 1907 the plant was operated under the direction of Messrs. Ross & Holgate and the lighting system placed upon a substantial operating basis. The growth of demand for the Westmount Company's power and lighting facilities progressed at such a healthy rate, however, that the capacity of the plant soon became inadequate to supply the demands made upon it. Accordingly, towards the end of June, 1909, the contractors commenced the construction of an extension to the plant to accommodate additional power and garbage destructor units. In December, 1909, the alterations were completed and the new units started up; during the spring of 1910 a series of tests have been made demonstrating the efficiency of the plant as a whole to the satisfaction of the engineers in charge.

The Generating Plant.

The Westmount power house and destructor plant is centrally situated on Gled road and in its construction, as can be seen from the general photograph (Fig. 2), considerable excavation work was necessary. In keeping with their surroundings, the buildings are of effective, yet simple design, the exterior being finished with Scotch brick.

Power House.—The power house, the building in the foreground of Figure 2, is approximately 70 feet by 40 feet in extent, and is built of brick and concrete with slate roof. In its lay-out the engineers have utilized the available space to best advantage. Generators, switchboards, engines, condensers, pumps, etc., are arranged on the ground floor and are quite easy of access.

Generators.—In the Westmount plant, the system of current distribution is three-phase, sixty-cycle, and to furnish this, four Crocker-Wheeler machines wound for 2,300 volt primary have been installed with capacity as follows No. 1, 200 kw; No. 2, 125 kw.; No. 3, 200 kw., and No. 4, 400 kw. (Fig. 1). With the exception

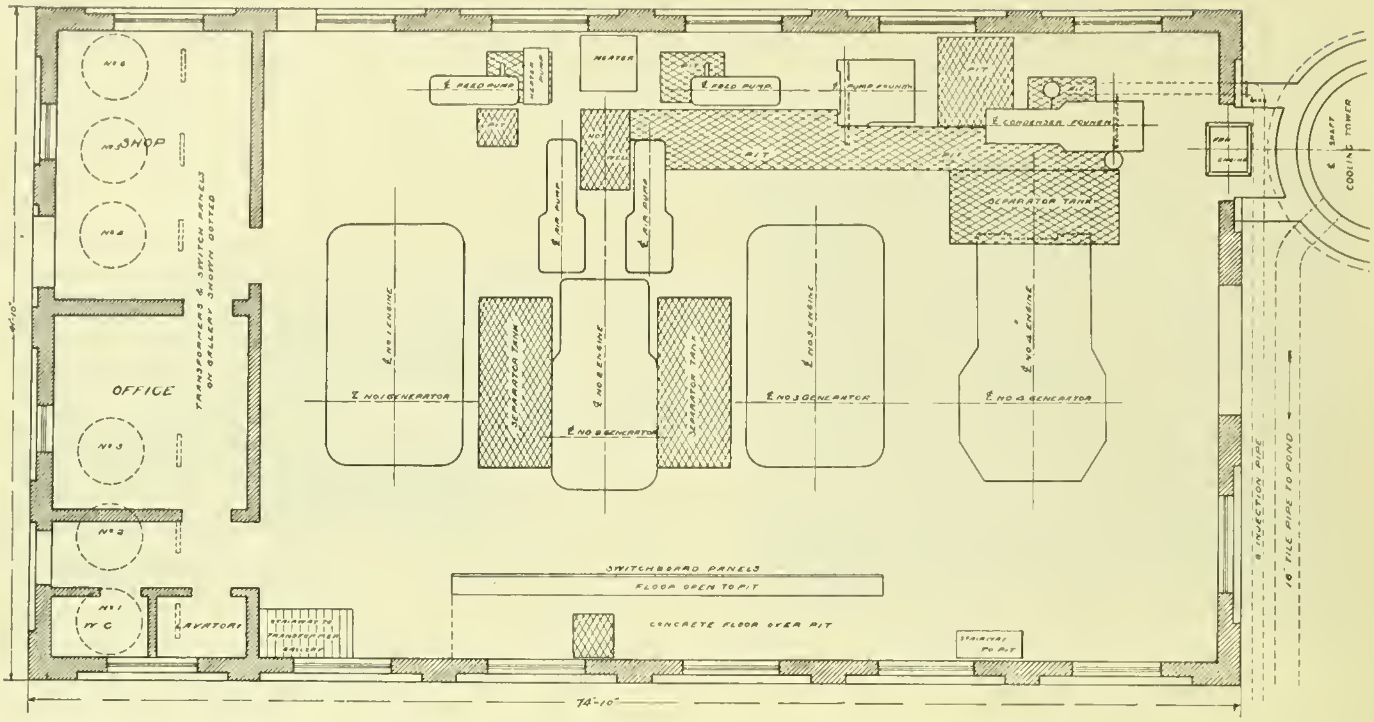


Fig. 1. Plan showing location of plant in Westmount power house.

of the 125 kw. unit, these machines have an overload guarantee of 50 per cent. for four hours, the small unit having 25 per cent. overload capacity. Each generator has its own exciter of the Crocker-Wheeler type, direct connected to the main shaft.

Switchboards.—The main switchboard, constructed of Blue Vermont marble, is located at the western side of the power house, and consists of twelve sections,—four generator and exciter panels, one totalling panel, six feeder panels, and one arc circuit control panel. The instruments on this board are of black oxydized finish, and the whole was equipped by the Canadian Westinghouse Company, Limited. In addition to the main switchboard there are five panels for the control of the magnetite arc lighting equipments, these latter supplied by the Canadian General Electric Company, Limited. Also one tie-in panel, for the control of the arc equipments. These six panels are located on the transformer gallery at the north end directly over the offices. This gallery is occupied by the mercury arc rectifiers and comprises five complete controlling sets of apparatus, each for a 50-light magnetite equipment, and consisting of switchboard panels, transformers, reactances, blowers and motors, rectifier tubes, etc., all supplied by the Canadian General Electric Company, Limited.

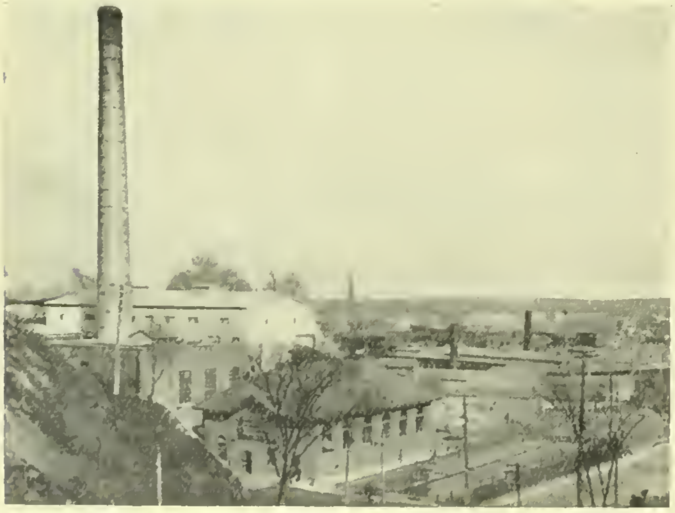


Fig. 2. Power house and cooling pond in foreground; boiler and incinerator room in rear.

The Engines.—The generators are direct connected to the engines, three of which are Robb, vertical, enclosed, quick revolution, cross-compound condensing types, two of 350 horse-power and one of 200 horse-power, run at 360 r.p.m. The fourth is a Bellis & Morcom, self lubricating, two crank, compound, vertical engine of 600 horse-power with 25 per cent. overload capacity, supplied by Messrs. Laurie & Lamb, of Montreal.

Auxiliaries.—In connection with the different machines, oil separator tanks are installed. Two 6 inch by 4 inch by 6 inch

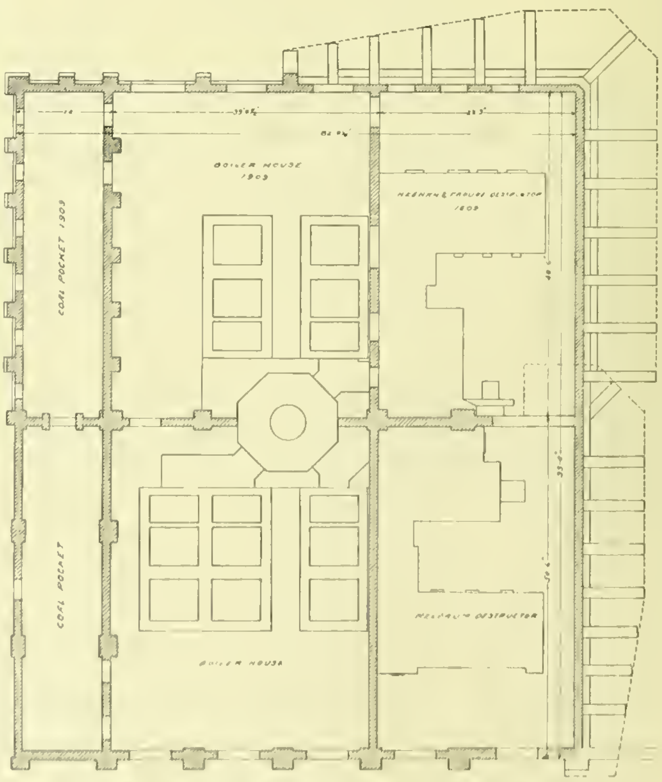


Fig. 3. Plan showing boiler and destructor house.

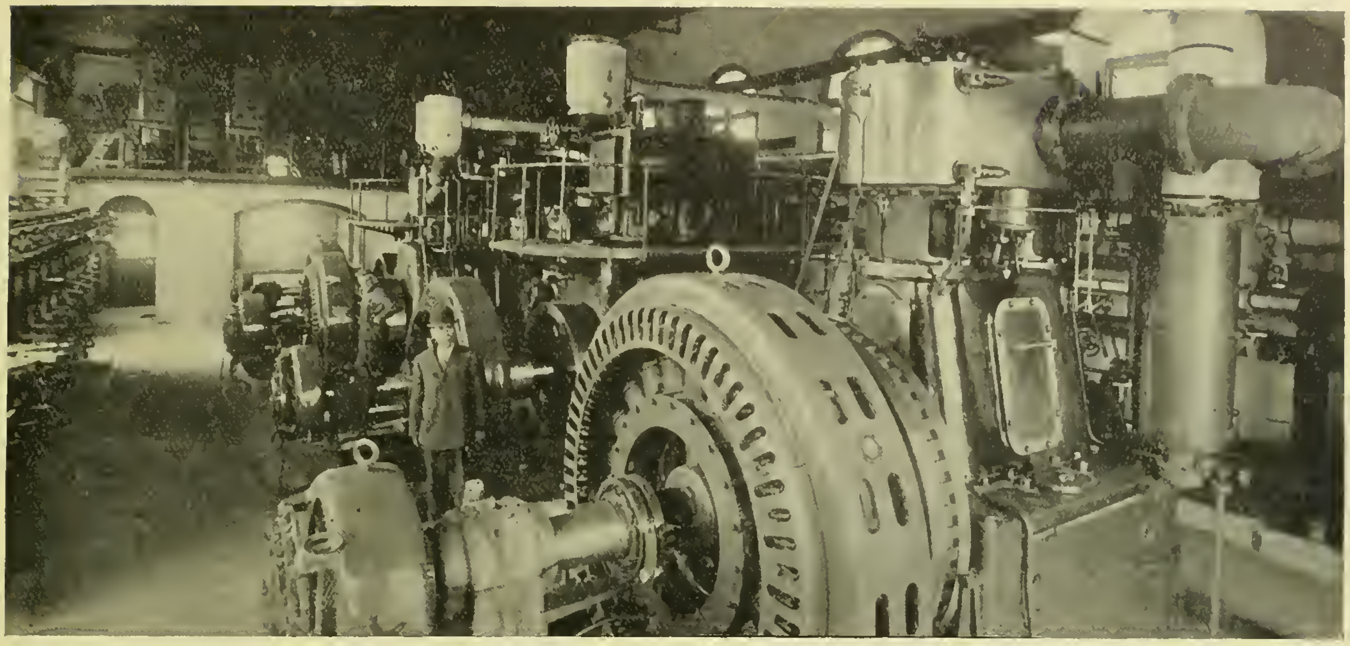


Fig. 4. Generators of Westmount Power Plant.

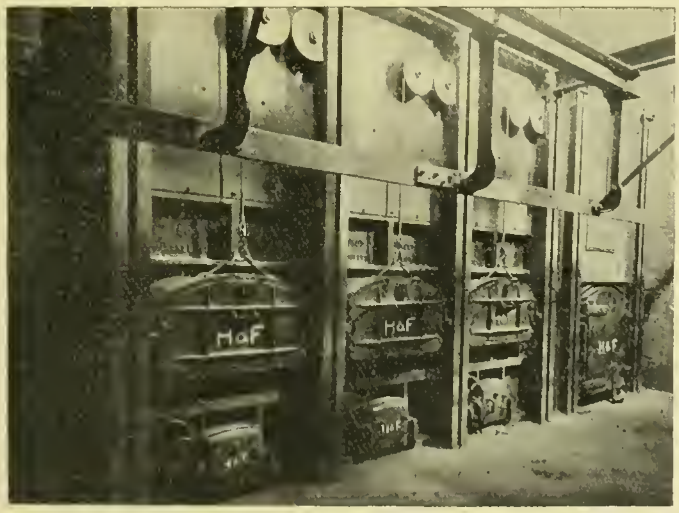
duplex Knowles double acting feed pumps supply water to the boilers. The condensers are two 8 inch by 16 inch by 16 inch single cylinder, double acting, and one 12 inch by 22 inch by 24 inch, all of the Knowles type. One 4 inch and one 2 inch 100 gallon pumps for the condensing water and two automatic Williams pump governors are installed. To heat the feed water one Webster feed water heater is used. Two Wright traps have also been placed on the main steam lines. The hot well and oil separator tanks are located in the pit. In connection with the cooling tower, one 7-inch by 6-inch Robb-Armstrong. simple, vertical engine has been installed, direct-connected to a volute pump, supplied by the John McDougall Caledonian Iron Works Company, Limited. A similar type engine is also direct-connected to a fan furnishing the forced air draft for the cooling tower.

Destructor and Boiler House.

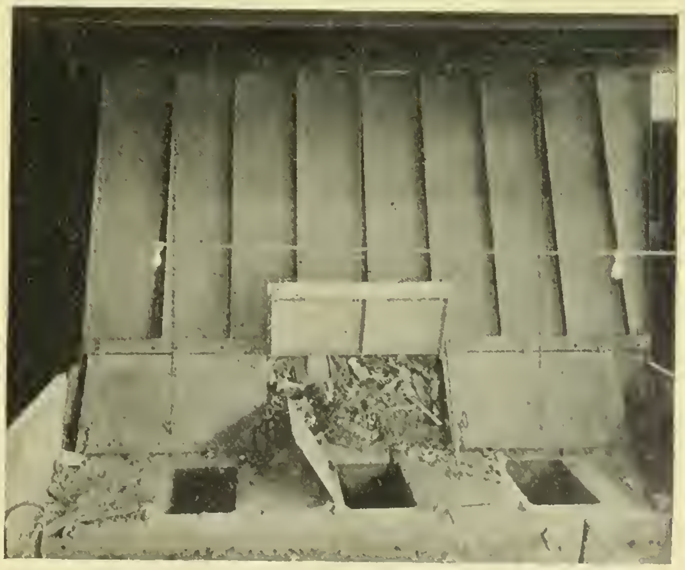
Immediately in the rear of the power house is the building where the garbage destructor, boiler room and coal pockets are located. This building was originally 40 feet by 90 feet in extent, but was recently enlarged to approximately 80 feet by 90 feet. The foundations are of concrete and the construction throughout is brick and concrete with roof of felt and gravel. The new extension was built to accommodate an extra destructor and the top of the old destructor building was at this time raised to the level of the new building and enlarged, while the top of the old and new destructor have been enclosed by a steel frame and corrugated iron sheds which protects the carts delivering refuse and enables rapid unloading of material. A clinker cable railway for the handling of clinkers and ashes from the furnaces is now under construction.

The Destructors.—The first destructor installed was a Meldrum 3-grate (75 square feet of grate area) 50-ton, continuous pattern, regenerative refuse destructor with steam jets for forced blasts, and was supplied by Messrs. Meldrum Bros., Limited, Timperley, England. The second destructor, which has just been installed, is a three-cell 50-ton pattern continuous grate Heenan Patent Refuse Destructor with 3 grates, having a total grate area of 75 square feet, and with common combustion chambers. It was manufactured by Messrs. Heenan & Froude, of Manchester and Worcester, England, and furnished through Messrs. Laurie & Lamb, their Canadian agents.

Boilers.—In the boiler house there are now five Babcock & Wilcox two drum, forged steel, water tube boilers with 2,197 square



Front view of destructor showing clinkering doors with air regulating valve for each cell; also door of combustion chamber.



Foot of garbage bin and doors opening into charging containers of destructor.

feet of heating surface each and rated at 200 h.p. per boiler. Three of these are arranged for hand firing with coal and two are connected to the destructor and fired by gases produced from burning refuse. All these boilers are equipped with Babcock & Wilcox super-heaters designed to furnish steam at 160 degrees F. Two of the boilers are equipped with automatic smoke consumers.

Chimney.—The power house chimney is 150 feet high, by 6 feet inside diameter, and is made of perforated, special radial brick blocks and banded. It is fitted with cast iron cap and ample lightning protection has been provided. It was built by the Alphonse Custodis Chimney Construction Company of New York.

Piping and Covering.—In the boiler room there are two headers connected to the boiler by long radius sweeps and to the power house there is a double steam line connection, ensuring a constant steam supply to the engines and auxiliaries. The exhaust is led from the engines to the condenser, to the hot well, and from there is pumped through a pipe line to the cooling tower, which adjoins the southeast corner of the power house and stands approximately thirty feet high. From here the water flows through an eighteen inch tile pipe to the cooling pond in front of the power house. This pond is 150 feet by 30 feet in extent, with an average depth of five feet, and is completely lined with tarred lumber. All live steam piping, boiler drums and feed piping have been covered with an 85 per cent. magnesia covering. The cooling tower was supplied by the John McDougall Caledonian Iron Works, Limited.

Method of Operating the Plant.

Briefly, the new incinerator plant and its method of operation may be described as follows: The refuse is fed on to a drying hearth at the back grates through three openings in the roof of the furnace. The top feeding doors are so arranged that no air is allowed into the furnace during the operation of charging the fires and the doors are worked from the clinkering floor level. The products of combustion after having passed through the combustion chamber and dust settling chamber, which is also used as a carcase crematory chamber, pass under a water tube boiler rated at 200 horse-power. After leaving the boiler the gases pass through a regenerator or air heater which is so arranged that air for combustion travels the full length of regenerator, outside a number of tubes through which the flue gases pass on their way to the stack. The forced draught is produced by a 66-inch diameter "Heenan" high efficiency centrifugal fan. The fan is directly coupled to a "Heenan" vertical high speed enclosed self-lubericating engine. It may be noted that the air is taken from the building in such a way as to cause complete ventilation. The capacity of the plant is 50 tons (2,240 pounds) per twenty-four hours, and the manufacturers guaranteed to evaporate 1¼ pounds of water from and at 212 degrees F. per pound of refuse and to maintain an average temperature between 1,700 degrees and 1,800 degrees F. in

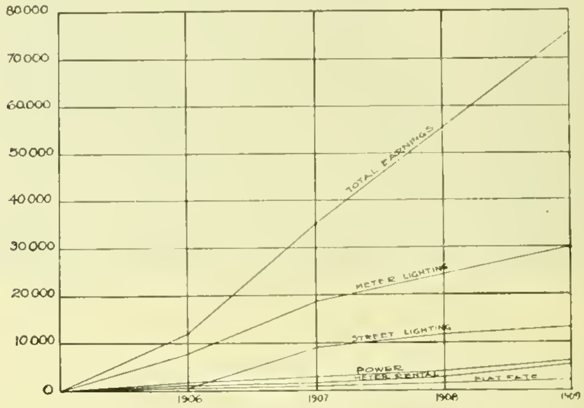


Fig. 5. Westmount Load Curves

TABLE SHOWING TESTS OF NEW HEENAN DESTRUCTOR

	TEST NO. 1.	TEST NO. 2.	TEST NO. 3.
Date	March 22nd, 1910.	March 29th, 1910.	April 12th, 1910.
Duration	9½ hours.	6⅔ hours.	5.75 hours.
Details of Fuel.			
Refuse garbage, etc., mixed, burnt	10575 lbs.=36.9%	15790 lbs.=51%	21110 lbs.=86.84
Screened combustible ashes	None	None	3200 lbs.=13.16
Unscreened combustible ashes	18085 lbs.=63.1%	15590 lbs.=49%	None
Total burnt	28660 lbs.=100	31380 lbs.=100	24310 lbs.=100
Rate of burning per hour	3016.8 lbs.	4704. lbs.	4106. lbs.
Rate of burning per square foot of grate area per hour	40.2 lbs.	62.7 lbs.	54.6 lbs.
Equivalent rate of burning per 24 hours	72403.2 lbs. (30.17 tons.)	112896. lbs. (50.8 tons)	99544. lbs. (44.4 tons)
Details of Water and Steam.			
Total water evaporated	49000. lbs.	37583. lbs.	39985. lbs.
Water evaporated per hour	5158. lbs.	5633. lbs.	6954. lbs.
Water evaporated per 1 lb. of fuel burnt	1.71 lbs.	1.20 lbs.	1.69 lbs.
Average boiler pressure (gauge)	122.6 lbs.	118. lbs.	130. lbs.
Average temperature of steam (F.)	601.6°	623°	605°
Average temperature of feed water (F.)	170.4°	170°	170°
Factor of evaporation	1.235	1.234	1.22
Water evaporated per 1 lb. of fuel burnt from and at 212° F.	2.11 lbs.	1.48 lbs.	2.06 lbs.
Average combustion chamber temperature	1973° F.	2202° F.	1972° F.
Maximum combustion chamber temperature	2084° F.	2500° F.	2156° F.
Minimum combustion chamber temperature	1800° F.	2000° F.	1796° F.
Temperature of gases at chimney base	481° F.	536° F.	532° F.
Details of Electrical Figures.			
Average kilowatt per hour	124	138	135
Maximum kilowatt	150	225	240
Kw. hours per ton (2,240 lbs.) of fuel burnt	91.8	66	76.5
Kw. hours per ton (2,240 lbs). of fuel burnt on basis of 30 lbs. of steam per kw. hour	127	89	128.8

the combustion chamber, which guarantees have all been successfully met.

Efficiency Tests.

Since the first unit of current was generated in the Westmount plant, the engineers have by a continuous series of tests kept a constant tab on operating costs, etc., and their records accordingly contain much data of an interesting character. The relationship between the incinerator and the electrical output of the plant was carefully studied when various tests were made with the Meldrum destructor, first installed, and of more recent date a series of tests were made with the new Heenan refuse destructor.

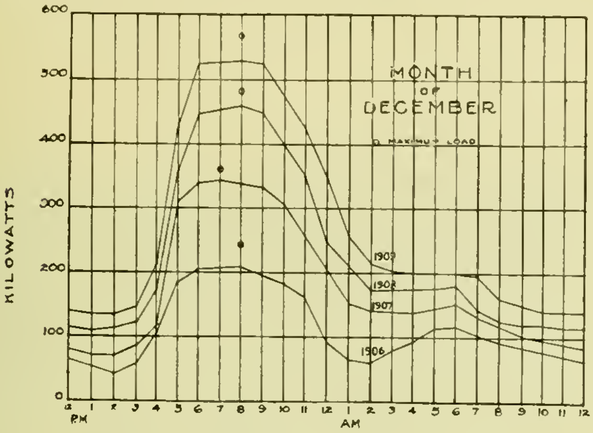


Fig. 6. Westmount Load Curves

Strange as it may perhaps seem to the uninitiated, these incinerators are taxed heaviest during the winter months. At this period of the year the destructors are in operation continually day and night, while during the summer months they are in commission during three months for only twelve hour periods each day. On rough approximation it may be said that in the winter months a saving of from one-third to one-half on the coal bill is effected by the use of the destructors. Another feature is the great extent to which the cinders produced can be utilized in concrete and roadwork. Up to October, 1909, 3,039 loads were used by the city roads department and in addition nearly 2,000 loads were disposed of to contractors.

The method of establishing the relationship between kilowatts of electrical energy produced and refuse destroyed is extremely interesting and is based on the assumption that in the burning of 5.5 pounds of coal, 1 kilowatt of energy is generated. The series of tests recently made on the new Heenan destructor will serve to illustrate the methods adopted in obtaining the above mentioned relationship and are therefore given in part below. (See table.) During the last part of test No. 1 the boiler was blowing off hard for about twenty-five minutes. In order to prevent this in test No. 2, the steam generated was used by a 360 horse-power engine, working condensing, and direct connected to one of the 200 kilowatt generators, carrying the whole of the station's day load. Test No. 3 was carried out to show the advantages derived from screening the separately collected anthracite ashes. The refuse used in test No. 2 was considered to be a good day's average of that collected in Westmount in the spring of the year. Had the tests been performed during the winter months a more satisfactory class of garbage would have been available, and the results would accordingly have been more satisfactory.

The interests of the purchasers during this series of tests were looked after by the writer, as general superintendent of the Westmount Power Department, and by Mr. F. B. Brown, representing Messrs. Ross & Holgate, supervising engineers. The incinerator plant was installed for Messrs. Heenan & Froude by their engineer, Mr. G. Kilner.

The load of the Westmount Power Department, as seen from the above data sheet, has shown a healthy increase during the four years of operation, and is of a nature particularly adaptable to economical management. A study of the curves submitted, Fig. 5, covering the month of December, 1906 to 1909, reveals a particularly flat peak load. The company's circuits are chiefly utilized for residential lighting purposes, while the heaviest motor load is furnished in the operation of water pumps for the near-by corporation of Notre Dame de Grace, a constant, twenty-four hour load.

Comparative Data Sheet.

The growth of the Westmount Power Company during their first three years of operation and other interesting figures are given below in a comparative data sheet.

	1907.	1908.	1909.
Net number of customers......	1,163	1,483	1,817
Equivalent number 16 c.p. lamps.	19,057	24,300	31,375
Total h.p. motors	169	184	214
Street arc lights	154	167	183
Total kw. connected load	1,337	1,652	2,081
Maximum kw. during year	355	460	545
Kw. output	1,024,394	1,283,031	1,659,545
No. tons of refuse disposed of ...	10,704	13,641	14,031
Cost per ton for destroying refuse (Operating)	$0.19	$0.21	$0.06
Cost per ton for destroying (fixed charges)	.36	.34	.40
Total cost per ton for destroying refuse	.55	.55	.46

Mr. Geo. W. Thompson, general superintendent of the Westmount power department, whose article appears above, has long been connected with the electrical interests of Canada. His first experience was gained in Montreal, where he engaged in the general electrical contracting trade. Later Mr. Thompson continued this work in the City of Belleville. Returning to Montreal district, he entered the engineering offices of the Lachine Hydraulic Land Company, and continued with the Montreal Light, Heat & Power Company when this latter concern absorbed the Lachine Company. A general engineering experience was gained with these companies, and when the Westmount Council decided in 1906 to proceed with the installation of a separate power and lighting plant, Mr. Thompson was appointed general superintendent. The efficient results obtained in managing the Westmount corporation's interests up to the present time is the best possible tribute to Mr. Thompson's business ability.

Mr. Geo. W. Thompson

Municipal Ownership in Fort William

Municipally-controlled public utilities as they conduct them in Fort William does not result in any apparent advantages to the citizens. This city controls everything pertaining to the water distribution and telephone systems and also retails electricity, purchased from the Kaministiquia Power Company, to the business men and residents of Fort William. During the first quarter of the present year receipts from the telephone system were $5,965, expenses, $8,168; loss, $2,203. For the same period the water expenses were $17,331; receipts, $11,577; deficit, $5,754. The electric contracts alone showed profits, total expenses being $16,113; receipts, $20,039, leaving profits of $3,926. This leaves a deficit on the combined municipal operations of $4,031, or at the rate of over $16,000 per annum.

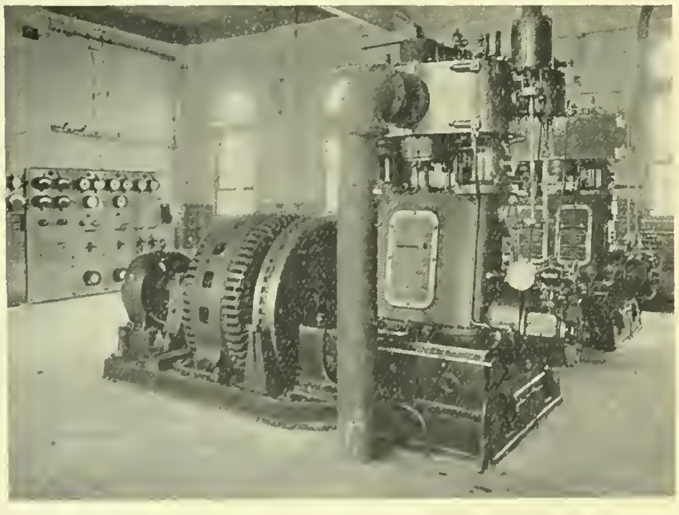
Town of Verdun Electric Light Plant

Municipal Ownership Favored in Quebec Town Combination Light and Waterworks Plant Operates Successfully—Only Best Machinery Used

The enterprising and progressive town of Verdun, which adjoins the city of Montreal and has a rapidly growing population of 10,500 people, decided last fall to follow the steps of its sister town of Westmount and to establish its own electric light plant. It already possessed a modern waterworks plant with a complete filtration system and the addition of an electric lighting station naturally suggested itself, in view of the small operation expenses resulting from the establishment of such a combination plant and the benefits to be derived therefrom.

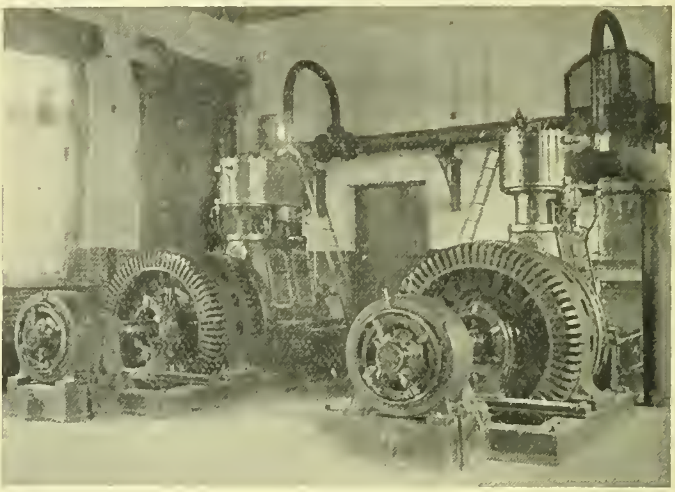
Beginning with the building, same consisted of solid brick walls laid on concrete foundations with pressed brick facings, steel columns and girders, the contract being executed by Isaac Collins, of Montreal. A 6 ton hand power crane was provided by the Dominion bridge Company, of Montreal. A Heine safety water tube boiler of 200 h.p. nominal capacity was installed by the Polsons Iron Works, Limited, of Toronto, through their Montreal agents, Messrs. Watson, Jack & Company, having a working pressure of 180 lbs. A Foster superheater installed inside the boiler gives a superheat of 120 degrees F. This boiler is the third boiler at present installed in the power house.

Two vertical, direct acting, single cylinder, double acting type, 5 1-4 inch by 3 3-4 inch x 10 inch feed water pumps from Messrs. J. P. Hall & Sons, Limited, of Peterborough, England, and each capable of handling 900 imperial gallons per hour, furnish the water requirements to the boilers. The feed water is passed through a closed type feed water heater of 300 h.p. capacity, where it is heated to over 200 degrees F. This heater was furnished by the Goulds Pump Company, of Montreal. The steam piping consists of extra heavy steel piping with steel flanges having Goetz corrugated bronze gaskets with asbestos rings and extra heavy nickel seated Crane valves. The 10 inch main steam pipe is provided with a huge expansion bend measuring 18 feet from flange to flange, and the bend extending out 10 feet. All the pipe work was executed by the Garth Company, of Montreal, and installed with unusual care, in view of the high pressure to be used. All the live steam pipes and flanges are covered with 85 per cent. magnesia cement. The exhaust pipes *remain* uncovered.



General View of Verdun Power House—During Erection

The Engine Room.—The engine room, 40 by 41 feet inside measurement, contains two units, each consisting of a 235 k.v.a., 3 phase, 2,300 volts, 60 cycle generator, direct connected to a vertical compound engine, running at 360 r.p.m. Each unit has also an exciter dynamo direct connected to the engine shaft. The engines were furnished by Messrs. Belliss & Morcom, Limited, of Birmingham, England, through their Montreal agents, Messrs. Laurie & Lamb, and showed a steam consumption of 15.1 lbs. per B.h.p. at full load, when condensing with a vacuum of 26 inches. The generators, the exciters and the 4 panel blue Vermont marble switchboard were furnished and installed by the Canadian Westinghouse Company, Limited, of Hamilton, Ont. The generators showed remarkably well in the tests, far exceeding their guarantees for temperature rise and efficiency. Room for a third unit of double the capacity is also provided in the engine room. The switchboard consists of the usual equipment of instruments and apparatus, except that there are absolutely no fuses. All switches are automatic, provided with overload trip coils and time limit relays. All wiring from the generators to the switchboard and from the latter to outside the building are drawn through conduits, so that no wires are visible in the engine room. Each generator is provided with a polyphase integrating wattmeter, and the coal consumption per k.w. hour can be daily determined, and all "leaks," bad firing, etc., promptly detected. The condensing apparatus used is the Kellogg barometric condenser. Each engine has one such 10 inch condenser, mounted on the top of the roof and furnished with a relief valve and exhaust head. The floor of the engine room is laid with ceramic tiling, and the walls are lined 6 feet high with white glazed tiling, all of which gives the engine room a beautiful and clean effect and is an inducement to the engineer to keep the apparatus likewise clean and bright. This contract was executed by Mr. Robert Reid, of Montreal.



Closer View of Generators and Engines, Verdun—Taken During Erection.

The Pump Room.—Going back to the pump room we find two sets of circulating centrifugal pumps These are steam driven direct connected 2-stage pumps running at 550 r.p.m., furnished also by Merrs. Belliss & Morcom, Limited, of Birmingham, England. The steam engines are simple, single crank, non-condensing, and the exhaust steam is used for heating the boiler feed water. The pumps furnish each 27,000 gallons of water per hour to the condensers mentioned above. These circulating pumps showed a steam consumption of 31 lbs. per hour. The condensed steam and condensing water are discharged to a hot well and what is not used for boiler feed purposes is then discharged into the river.

The Distribution System.—The transmission lines through the tow nconsist of 30 and 35 foot cedar poles with the usual cross-arms, pins, insulators, etc. The primary wires consist of No. 4 and No. 2 B. & S. weatherproof copper wire. The secondaries of No. 6 B. & S. weatherproof wire. No wires of less than No. 6 B. & S. are used, except for the house connections, where usually the size No. 10 B. & S. is used. All lightning arresters, transformers and meters are furnished by the Canadian Westinghouse Company, Limited.

Within the next two months the town will have its new street lighting system in operation. It will consist of seventy-five 4 ampere metallic flaming (magnetite) arc lamps, operated by two 50-light regulator and rectifier outfits. The lamps will be hung on brackets extending 12 feet from the poles. In addition to this electric light station, the town installed an electrically operated sewerage pumping station. The machinery consisted of a 20 inch centrifugal pump furnished by the Goulds Pump Company, of Montreal, having a capacity of 10,000 imperial gallons per hour and driven by a direct connected 3 phase, 2,200 volt, 60 cycle Westinghouse induction motor of 75 h.p. capacity.

The entire cost of this electric light plant will be in the neighborhood of $65,000, and in this connection it should be said that the light committee of the town, consisting of Alderman C. Manning (chairman), Alderman J. A. A. Leclair, and Alderman H. Hadley, sr., adopted the far-sighted policy of purchasing, not the lowest priced machinery, but the machinery with the greatest stability and the greatest economy in operation. The town engineer, Mr. H. Hadley, jr., had charge of the construction work. The plans and general supervision of the work, etc., were done by the office of Mr. C. Brandeis, C.E., of Montreal.

Size of Hydro-electric Generating Units

By L. E. Imlay

The size of generating units in an hydro-electric power plant is subject to the following limitations: (a) to the capacity of the machines which manufacturers of hydraulic and electric apparatus can build; (b) to the physical limitations of the installation due te amount and head of water available; and (c) to operating conditions which most be met, such as sub-division of load to insure reasonable continuity of service, etc.

There is at the present time no definite maximum limit to the size of turbines, so far as manufacture is concerned. The largest sizes are usually assembled in place and the size of the parts is limited only by the capacity of the railroads to transport them and, to some extent, by the capacity of travelling cranes available for handling them in the manufacturers' works and in the plant where they are to be installed. Electric generators involving large masses of active iron and copper can be arranged for effective water cooling. These can also be assembled in place in the power plant and the limitations on their size are the same as those which apply turbines. Units of 20,000 horse-power, or even greater in capacity, can now be purchased from several different manufacturers.

In the installation itself, the capacity of a unit may be limited by the amount and head of water available. This limitation is rarely controlling, but may exist in the case of a very small plant. When the amount of water is not limited, the matter of head alone may determine the size of the units. The reason for this is as follows: In order to obtain maximum efficiency the velocity of the rim of the turbine runner at normal speed must be approximately 67 per cent. that of the spouting velocity of the water through the guide vanes of the distributor. The spouting velocity of the water is, of course, a fixed amount due to the head of water available. The frequency chosen for a power plant will probably be that which is now almost universally adopted, namely, 25 cycles, and, in order to keep down the cost, the number of poles of the generator will be as small as possible. The frequency and number of poles of the generator being chosen, the speed of the main shaft is determined. The speed of the shaft being determined, and the spouting velocity of the water through the guide vanes of the distributor being fixed by the head of water available, the diameter of the runner is determined within narrow limits. The Francis inward discharge type of turbine, which is almost universally used at the present time, is limited in capacity to the amount of water which can be discharged through it. Increase in the depth of the wheel beyond a certain amount does not increase its capacity to deliver power. The limiting factor is the cross sectional area of the openings between the vanes of the runner through which water must pass, but this, of course, is a fixed amount when the diameter of the runner is decided upon. In other words, the capacity of the turbine to deliver power is limited to the amount of water which can be discharged through its runner or runners. Thus under 130 feet head, with a 12-pole, 25-cycle alternator, a single runner Francis turbine can develop economically about 5,500 horse-power, and its ultimate capacity is less than 7,000 horse-power. Approximately double this amount of power can be developed by placing another runner on the shaft, but if more than two runners are used, complications of design are met with. With vertical shaft turbines two runners on a single unit is probably the practical limit. Horizontal shaft turbines can, however, be more readily adapted to several runners, but it is questionable whether the multiple runner design is justified from an operating point of view, except in cases where geared units are used and large amounts of power are to be developed at a very low head.

Maintenance Regulations

The foregoing limitations are of such character that the elements which constitute them can be readily determined. The limitations due to operating conditions are not so definite, and generally not controlling, but must be considered in the economical design and operation of a power plant. The investment per kilowatt decreases rapidly as the capacity of the units increase. So far as first cost is concerned, therefore, the units should be as large as possible. The ordinary maintenance of a power plant is nearly proportional to the number of units, irrespective of size. It is true that the repair parts for the larger units cost somewhat more, but this is a comparatively small item. The principal expense in connection with maintenance is the cost of labor used in dismantling and reassembling the units. If proper facilities are provided for this purposes there is but little difference in the cost of maintaining units of different sizes. This statement applies only to units having capacity above 5,000 h.p.

The cost of operating a power plant up to a certain size is nearly independent of the number of units. For instance, in a plant consisting of five 5,000 h.p. units a certain minimum number of switchboard attendants, turbine oilers, etc., will be required. If the plant is extended to twelve 5,000 h.p. units it is probable that no additional attendants will be required. If the plant, however, is still further extended it will probably be necessary to employ approximately twice the number of attendance on account of the area over which the operators work having been increased beyond the capacity of one crew of attendants. It is probable that one crew of attendants cannot properly operate more than twelve separate units, ranging in size from 5,000 to 20,000 h.p. each. This, of course, depends greatly on the layout of the plant and the arrangement of facilities for operation. It follows, therefore, that so far as first cost and maintenance and operating expense are concerned the units should be as large as possible.

Must Carry One Spare Unit

On the other hand, there are strong arguments in favor of a large number of comparatively small units. Suppose that we have two plants, each of which is required to deliver 100,000 horse power. As every plant must have at least one spare unit, one of these is equipped with six 20,000 h.p. units and the other with twenty-two

5,000 h.p. units. In order to operate such a plant with any degree of safety or probable continuity of service, the load should be separated into three or at least into two sub-divisions. Suppose the service divided into two divisions of 46,000 and 54,000 h.p. each. In the plant having the 20,000 h.p. units, three will be required on each sub-division of the load and there will be no spare. In order to properly operate such a plant with a reasonable regard for continuity of service at least seven 20,000 h.p. units will be required, or a plant capacity 40 per cent. in excess of the service supplied. Suppose the service sub-divided into two divisions of 46,000 and 54,000 h.p. each, supplied from the plant with twenty-two 5,000 h.p. units. Ten units will be required on one sub-division of the load and eleven on the other, still leaving one spare for emergency. The reserve capacity of this plant is only 10 per cent. in excess of the plant capacity. There is, therefore, little advantage, so far as first cost of plant is concerned, in using the larger units when so much reserve capacity will have to be provided. On the other hand, the plant equipped with 20,000 h.p. units can be operated with one crew of station attendants, while the other will require two crews.

Advantage can be taken of both low plant cost and low operacting expense by combination of two or three sizes of units in the same plant. The following table shows some of the grouping of units that will exist in plants with units of various sizes and having an output of 100,000 horse-power. An example is assumed by way of illustration where the load is to be sub-divided into two divisions of 46,000 h.p. and 54,000 h.p. each. This assumption is made because neither sub-division is an even multiple of the capacity of the units which would permit a more economical grouping of them. In the first seven cases shown in the table, the plant capacity is 10 per cent., and in the second seven cases the plant capacity is 20 per cent greater than the output we have assumed.

Table Showing Comparative Results from Different Groups of Units.

No.	No. of Units.	No. of Units and Capacity h.p.	Plant Capacity h.p.	Units on 46,000 h.p. Load.	**Units on** 54,000 h.p. Load.	Units in Service.	Unused Capacity of Units in Service h.p.	Units in Reserve.	Cacacity of Units in Reserve h.p.	Operating Crews Required.
1	22	22- 5,000	110,000	10- 5,000	11 5,000	21	5,000	1	5,000	2
2	17	5-10,000 12- 5,000	110,000	2-10,000 6- 5,000	3-10,000 5- 5,000	16	5,000	1	5,000	2
3	14	8-10,000 6- 5,000	110,000	4-10,000 2- 5,000	4-10,000 3- 5,000	13	5,000	1	5,000	2
4	12	10-10,000 2- 5,000	110,000	5-10,000	5-10,000 1- 5,000	11	5,000	1	5,000	1
5	10	4-20,000 6- 5,000	110,000	2-20,000 2- 5,000	2-20,000 3- 5,000	9	5,000	1	5,000	1
6	7	4-20,000 3-10,000	110,000	2-20,000 1-10,000	2-20,000 2-10,000	7	10,000	None	None	1
7	11	11-10,000	110,000	5-10,000	6-10,000	11	10,000	None	None	1
8	15	9-10,000 6- 5,000	120,000	4-10,000 2- 5,000	5-10,000 1- 5,000	12	5,000	3	15,000	1
9	14	10-10,000 4- 5,000	120,000	4-10,000 2- 5,000	5-10,000 1- 5,000	12	5,000	2	15,000	1
10	13	11-10,000 2- 5,000	120,000	5-10,000	5-10,000 1- 5,000	11	5,000	2	15,000	1
11	9	5-20,000 4- 5,000	120,000	3.20,000 2- 5,000	3-20,000	7	10,000	2	10,000	1
12	7	5-20,000 2-10,000	120,000	2-20,000 1-10,000	3-20,000	6	10,000	1	10,000	1
13	6	6-20,000	120,000	3-20,000	3-20,000	6	20,000	None	None	1
14	12	12-10,000	120,000	5-10,000	6-10,000	11	10,000	1	10,000	1

In considering the above table the following conditions must be kept in mind: (1) The units must be as small in number as possible in order to keep down the first cost; (2) the number of units in service at one time must not be greater than twelve in order that one crew of men may be able to operate them; (3) the unused capacity of units in service should be as small as possible; (4) the number and capacity of units in reserve should be as large as possible; (5) the reserve capacity should be at least equal to the capacity of the largest unit in the plant.

Consideration of the table shows that cases 8, 9, and 10 will best fulfill these five conditions. Of these three, the first cost of No. 8 will be greater than No. 9, and the first cost of No. 9 will be greater than No. 10. The desirability of these three combinations to the operating man will be in the reverse order to that indicated by the first cost on account of the greater adaptability of the smaller units to the varying conditions of load.

I am aware that the above is an attempt to make a somewhat exact analysis of conditions which cannot be exactly analyzed. In a power plant the load varies from day to day, and even from minute to minute. The division of the service which is smaller one day may be larger on the next. Part of the load may consist of long distance service for supply of public utilities whose peak lasts for an hour at most. Part of it may be commercial service, which is practically constant for ten hours per day, six days in the week. Part of it may be for electro-chemical service which lasts twenty-four hours per day for every day in the year. In no two plants is the character of the service the same, so that each plant presents a different problem. Even the nature of the different services cannot be foretold except in a general way. The table given above is based on experience of conditions which have to be met in actual practice in the operation of a power plant.

Consideration of the foregoing leads me to conclude (1) that after operating conditions are satisfied the main generating units in a power plant should be as large as the physical limitations will permit; (2) that in a plant to supply not exceeding 100,000 horse-power under usual operating conditions the largest units should have a capacity of about 10,000 horse-power each; (3) that in a plant of the size here considered, and also in plants of larger size, a few units of relatively small size are amply justified.

Vancouver and the Western Provinces

British Columbia's Magnificent Water Powers —Six of the Largest Described with Maps Showing Locations

It is extremely probable that very few of the citizens of Eastern Canada are aware of the fact that away out here on the Pacific Coast, in a province which until comparatively a few years ago was accorded scant attention by the people of the older settled portions of the Dominion, there is being carried to completion a series of electrical development undertakings planned on a scale not exceeded anywhere in Canada. The agricultural, mineral and industrial possibilities of British Columbia justify these enterprises, and it is cause for congratulation that we have within our borders citizens who are quick to recognize the needs of our rapidly expanding communities and prompt in applying themselves to the task of providing the means whereby industries may be established and our natural wealth be turned to good uses. Water powers abound throughout the province, but whilst almost every town and hamlet enjoys the benefit of electric light produced from some mountain stream capable of developing thousands of horse-power, the plants on the Coast designed primarily for the generation of power in large quantities, are as yet limited to two on Vancouver Island and two in the vicinity of Vancouver City, on the mainland. For the information of ELECTRICAL NEWS readers we have had prepared the following map, which shows the geographical location of the plants in operation, under way, and proposed, and on that account will doubtless prove interesting to many.

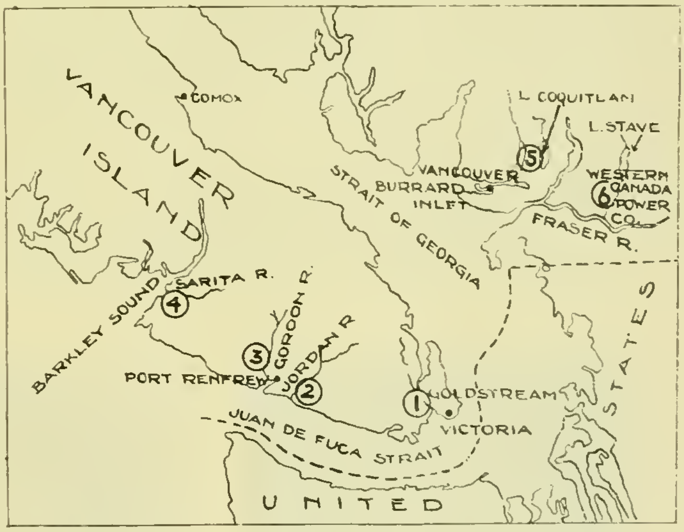
No. 1 Plant, Vancouver Island: This is located at Goldstream, about 12 miles northwest from Victoria, on the E. & N. Railway, which at present furnishes about 3,500 horse-power, used for operating the British Columbia Electric Railway, the city power plant and various industries. To supplement this supply, the B. C. E. R. Company is now incurring a further large outlay at Jordan River.

No. 2 Plant, at Jordan River, Vancouver Island: Last fall the citizens of Victoria approved a by-law which empowered the city council to enter into an agreement with the British Columbia Electric Railway Company for the development of a power scheme that would enable the company to extend its lines in and about Victoria city and also furnish power for industrial purposes. Immediately the company started at Jordan River, a power development enterprise that will involve an expenditure of $1,500,000 and will require three years for its completion. The Jordan drains a large watershed and flows into the Strait of Juan de Fuca on the southwest coast of Vancouver Island, about 40 miles from Victoria. The transmission line will be somewhat longer—probably about 45 miles. Since the commencement of operations in October last considerable progress has been made. Survey parties have been at work taking levels, finding altitudes, determining grades; fallers are dropping the huge firs, spruce, cedar and hemlock, making an open path through the dense forest for the steel rails to follow, and clearing sites for power house and reservoir; buckers have been cutting the trees into logs; donkey engines have been puffing and straining at the uprooting of massive stumps; a saw mill has been built and lumber is being manufactured; wharves and slips have been built, camps constructed, etc., and yet the work has scarcely passed the initial stage. The principal reservoir will be located at Forebay camp; from this four steel pipes lines will convey the water down the hill to the power house. From Forebay reservoir a flume is being built six and one-half miles to bring the water from Jordan River. A light railway will follow the course of the flume to the intake in order to permit of the easy transportation of machinery and supplies. Over 500 men are now employed, and the company would make the number 1,000 if they could get the laborers.

No. 3 Plant (proposed) at Gordon River, Vancouver Island: The West Coast Power Company, Limited, of Victoria, has applied to the Legislature for permission to take 3,500 cubic feet per second of water from the Gordon and Nitenat Rivers, which empty into Juan de Fuca strait at Port Renfrew, on the west coast of the Island, about 60 miles from Victoria. The available fall is about 350 feet, which is expected to develop 110,000 h.p. The chief promoter is Mr. Lorenzo Alexander, who is said to have the backing of a wealthy United States syndicate.

No. 4 Plant (proposed) or Barkley Sound, in the Alberni district, about 75 miles from Victoria: The West Coast Power Company, Lorenzo Alexander, managing director, has applied for 2,800 cubic feet per second to be taken from the Sarita river. The head will be 200 feet, which promises 100,000 h.p.

No. 5 Plant is that of the Vancouver Power Company, located on the North Arm of Burrard Inlet, about 16 miles from Vancouver. This plant furnishes the large quantity of power required for the British Columbia Electric Railway's extensive system of tram lines in Vancouver, North Vancouver and New Westminster, as well as for the street lighting and present industrial needs of the three cities and connecting rural municipalities. The rapidly increasing population of the communities mentioned has created a demand for light and power almost sufficient to account for every kilowatt at present being developed by the Vancouver Power Company, and in order to create a surplus sufficient for the immediate future the company is expending an enormous sum of money in doubling the capacity of the two and one-half mile tunnel which pierces a lofty mountain and connects their power house on the east shore of the North Arm with Lake Coquitlam, a body of purest water six miles long, on the opposite side of the range. The available supply in this lake is being increased by the erection of a huge dam which will raise the level of the water about 85 feet, and thus permit the placing of another electrical unit capable of developing about 20,000 additional horse-power. The original outlet of this lake led to the Fraser River, about 18 miles south of the south end of the lake. Flowage through this outlet was stopped by the construction of a 12 foot dam in order to create a reservoir, which will shortly be vastly increased in extent by the raising of the former dam to a height of 85 feet. The water discharges through the 12,774 foot tunnel into Trout Lake, or Lake Buntzen, a body of water about three miles long, the north end of which is about 1.5 miles from the power house. From Lake Buntzen the waters are



Map Locating Six of Vancouver's Water Powers

P. S. Coate
First Vice-President Canadian Electrical Association

led through flumes and steel pipes to the power house, located at the foot of a steep mountain side at sea level. The hydraulic head on the waterwheels is 400 feet, and water is fed to the Pelton wheels through riveted steel pipes varying from 54 inches to 60 inches in diameter, and to the 10,000 h.p. Doble wheels through pipes varying from 7 feet to 6 feet in diameter. The original tunnel between Lakes Buntzen and Coquitlam was 8 1-2 feet square, but is being enlarged to 13 1-2 feet square, which will more than double the capacity.

No. 6 Plant (under construction) is that of the Western Canada Power Company at Stave Lake, about 35 miles east of Vancouver, where over 100,000 horse-power is being developed and almost twice that quantity is available. Work on this plant has been in progress for about three years, and it is confidently expected that power will be ready for distribution throughout Greater Vancouver and surrounding country in the fall of 1911. The charter of the company confers wide powers, and a competing street railway system and various rural lines are promised. There will be a market for every horse-power not needed by the company for their transportation enterprises. In the next issue of the CANADIAN ELECTRICAL NEWS we hope to present to our readers an interesting report covering the inception and progress of this great work up to the present time. The sketch will be illustrated with fine views.

Cranbrook's New Electric Power Plant—Completed a month in advance of contract requirements

According to the contract entered into with the corporation, the Cranbrook Electric Light & Power Company were to have their new plant in readiness to provide power and light 24 hours daily by May 22nd under penalty of forfeiting $3,000. This clause in the contract proved an efficient spur to the management and all concerned, the result being that the new plant was in readiness a month prior to the date fixed. Tests were made April 18th and following days, and the plant operated at a capacity far above what is called for in the contract. Everything worked like a charm, reflecting great credit upon those responsible for its installation—Mr. James Jack, erecting engineer for the Goldie-McCulloch Company; Mr. W. Priddle, electrical engineer, representing the Allis-Chalmers-Bullock Company, and Mr. Robert Eakin, the company's chief engineer. The various tests were made under the supervision of the company's superintendent, Maurice Quain, and were to his entire satisfaction.

The alternating current generator is a splendid machine of the latest design, being of the revolving field type, and was manufactured by Allis-Chalmers-Bullock, Limited, of Montreal. It is directly connected with a Goldie-McCulloch horizontal cross compound high speed Corliss engine, which is capable of developing 450 h.p. The generator is of 250 k.w. capacity, and is designed to operate continuously on 25 per cent. overload and at 50 per cent. overload for two or three hours, which would raise its output from 450 h.p. to 510 h.p. The revolving field, which is of the most modern construction, has a cast iron spider, which is in two halves, and for convenience in installing are bolted together on the engine shaft, and has around its periphery 48 field poles, which are dovetailed and held firmly to the rim of the spider by wedges. The

C. H. Mitchell

R. G. Black

V. Boyd

MEMBERS OF THE C. E. A. CONVENTION COMMITTEE total of the revolving part is in the neighborhood of 10,000 pounds. The armature, which is the stationary part, contains the high voltage, two phase sixty cycle winding. The iron core is also designed for the maximum of ventilation, having ventilation ducts every two inches of width of iron. The weight of the armature is about 15,000 pounds, making for the whole machine a total weight of 25,000 pounds, or roughly speaking, twelve and a half tons.

The exciter is of the belted type, 13 k.w. capacity, and has all the latest and most up-to-date improvements. The switchboard is of marble and has upon it all the switches and rheostats for the proper operation of the new plant. The total weight of the big engine, referred to at the outset, is 39 tons. This engine is fed with oil by gravity and is equipped with Richardson's sight feed of latest design.

There is a boiler equipment of a capacity of 710 h.p., consisting of a battery of three Goldie-McCulloch manufacture. The whole plant is equipped with the latest improvements in all parts, steam as well as electric.

West Kootenay Power and Light System —Operating plants at three points, more than 30,000 h.p. developed

Perhaps the most important electric power development system operating in the Mountain district of British Columbia at the present time is that of the West Kootenay Power & Light Company, Limited, with head offices at Rossland, B.C. This company own and operate the South Kootenay Water Power Company, the Cascade Water, Power & Light Company, Limited, the Rossland Water & Light Company, Limited, and the Okanagan Water Power Company. Power and light are furnished to Trail, Rossland, Grand Forks, Phoenix, Greenwood and Boundary Falls, the smelters and mines calling for large quantities. The capital invested in the company's power houses, transmission lines and sub-stations represents a very large sum, but it is satisfactory to know that a handsome return is being made in the way of earnings. Below we give some interesting particulars concerning the personnel of the West Kootenay Power & Light Company, Limited, their various power plants, equipment, etc.

The directors are: President, W. M. Doull, Montreal; vice-president, Frank Paul, Montreal; and Messrs. C. R. Hosmer, W. R. Baker, W. Hanson, George Benson, J. S. C. Fraser, all of Montreal; general manager and chief engineer, L. A. Campbell, Rossland, B.C.; general superintendent, J. D. McDonald, Rossland, B.C.; hydraulic engineer, W. Anderson, Rossland, B.C.; secretary, W. Roach, Montreal; and E. E. Gibson, superintendent of the South Kootenay Water Power Company.

W. A. Bucke
Chairman Finance Committee C.E.A.

The Three Power Plants.

There are three power plants in all, ready to supply energy to this system (1) at Lower Bonnington Falls, (2) at Upper Bonnington Falls, (3) at Cascade City. The Upper Bonnington, No. 2, is the largest, and at the present time is supplying all the needs of the company, so that power houses (1) and (3) are held as auxiliaries.

Power House No. 1.—This is situated at Lower Bonnington Falls, about 18 miles from Nelson, B.C. The equipment includes three a.c. Canadian General Electric 1,100-volt 3-phase 60-cycle generators, with a combined capacity of 3,000 kilowatts, and twelve 250 kw. 1,100/20,000 air cooled transformers.

Power House No. 2.—This is situated near Nelson, where

L. V. Webber
Captain of Central Stations Baseball Team

G. R. Fulton
Member Convention Committee

Geo. C. Rough
Captain of Manufacturers Baseball Team

32,000 h.p. can be developed. There are at present installed two Canadian General Electric vertical type 5,625 kw., 2,200-volt, 3-phase, 60-cycle generators, a 12,000 kw. 2,200/60,000-volt and a 3,700 k.w. 2,200/22,000-volt Westinghouse transformer. There are 84 miles of double transmission lines, carrying 60,000 volts, and 50 miles of double line carrying 20,000 volts. Rossland is supplied by both these systems, Nelson only by the 20,000-volt line.

Power House No. 3.—Situated at Cascade City. The three generators are each a.c., 3-phase, 60-cycle, 750 k.w., Westinghouse manufacture. There are nine 250 kw. 2,200/22,000-volt oil insulated air cooled transformers. Twenty-five miles duplicate transmission lines to Grand Forks, Phoenix, Greenwood and Boundary Falls are so connected that power can be supplied from Bonnington Falls at 60,000, or from the Cascade system at 20,000 volts.

The Sub-stations.

These are situated at Trail, Rossland, Grand Forks, Phoenix, and Greenwood. The step-down transformers at the various stations are distributed as follows: At Trail, three 1,250 kw., 20,000/550 volts; Rossland, nine 250 kw., 20,000/2,200 volts, and three 1,250 k.w., 60,000/2,200 volts; Grand Forks, four 1,250 kw., 60,000/440 volts, and six 250 kw. 20,000/440 volts; Phoenix, three 1,250 k.w., 60,000/2,200 volts, and three 250 k.w., 20,000/2,200 volts; Greenwood, three 1,250 k.w., 60,000/2,200 volts, and six 250 k.w. 20,000/2,200 volts. All 60,000-volt transformers and the 20,000-volt transformers at Trail are oil insulated and air cooled.

Western News Notes

Richard Male, chief operator at the Burnaby sub-station of the British Columbia Electric Railway on May 19 sustained such severe burns on his face, arms and legs, that he succumbed later to his injuries. He was unable to state just how the accident happened, but it is thought that while examining some new high tension switches he touched or brushed against a high tension wire, forming an arc, which caused the burns and also set fire to the building, necessitating the calling out of the Westmintser fire department.

The British Columbia Electric Railway has commenced work on the erection of large repair shops at the south end of the Westminster bridge for the use of the Fraser Valley branch of the system. The company has purchased about 50 acres of land there, and in addition to car shops provision will be made for dockage and yardage facilities.

Victoria's street railway and electric light services were temporarily put out of order May 19th shortly after 9.30 p.m. by a prowling wild animal. An eight foot panther crawling along a steep cliff underneath which the high power wire from the Goldstream power station to Victoria runs, apparently made a fatal mis-step, and in falling clutched and carried down with it the power cable. The big cat is being mounted and will adorn the den of Electrical Engineer Tripp.

Mr. Robert Sample has been appointed foreman of construction by the British Columbia Electric Railway, taking charge of all new work on the mainland. He has been with the company for nineteen years, and lately has been acting as foreman of construction on the New Westminster interurban line. At present Mr. Sample is absent in the East on a vacation trip, and will take up his new duties on his return.

A new wage scale agreement, to endure for three years, has just been entered into between the British Columbia Electric Railway and the men employed on its tram systems on the mainland and Vancouver Island. The old agreement expires June 30th. Negotiations have been in progress since the beginning of the year, and for a time a deadlock and an appeal to arbitration seemed probable, but wiser counsels prevailed. The new schedule is based on an hourly wage rate, to the various classes of employees. The advances are general, but the long service men benefit most, especially motormen and conductors. The present wage bonus profit-sharing system adopted several years ago will be dropped.

Vancouver citizens hailed with joy the announcement that the street railway company intend to at once proceed with the construction of a two-mile extension of the Keith road or Capilano line in North Vancouver. The trip up the Canyon is a great scenic treat hitherto denied to many owing to the distance to be walked up a steep grade, and the extension will add greatly to the traffic.

The city of Prince Rupert has applied to the government for a record of 309 inches of water for power development purposes.

There is great activity in the electrical line in Vancouver owing to the tremendous amount of building in progress. Work at outside points is also very brisk, the result being that there is a dearth of skilled labor and consequent delay in the execution of contracts.

J. F. McFerran, a lineman in the employ of the British Columbia Electric Railway, was instantly killed June 14th through coming in contact with a live wire. He was in charge of the company's power wire which runs from the power plant at Barnet to New Westminster.

The British Columbia Electric Company complains of the faulty character of the wiring being done in the rural districts surrounding the city. In one instance all joints were without solder, while in another the wires were altogether too small to give any kind of adequate service. There is danger from such practices, the only remedy being compulsory inspection on all wiring.

Merritt, B.C., is to have a modern electric lighting plant at a cost of $15,000.

Mr. H. M. Lloyd, Assistant Superintendent of Maintenance, B. C. E. R., Vancouver, left for the East early in June to enjoy a well-earned vacation. While in Montreal he attended the annual meeting of the Dominion Electric Railway Association.

A most convincing illustration of the phenomenal growth of Vancouver is afforded in the fact that the city's percentage of the British Columbia Street Railway Company's earnings for May was $2,776.60. For the five months of the year just past the company's payments to the city total $12,339.16, as against $7,732.84, the amount paid in the same period last year.

Large Contract for Aluminium Cable

The British Aluminium Company, Limited, through their Canadian agents, Messrs. Parke & Leith, have been awarded by the Hydro-Electric Power Commission of Ontario a contract for approximately three hundred miles of bare aluminum cable, ranging in size from No. 2 to No. 4/0 B. & S. gauge, to be installed between the Commission's various sub-stations and the following points, namely: Berlin and Waterloo; London Asylum; London City sub-station No. 1; London sub-stations No. 1 and No. 2; Preston and Galt; Preston and Hespeler; St. Thomas; Woodstock and Ingersoll; Hamilton Water Works; Pumping Station.

This firm has also closed a contract with the City of Guelph for approximately five miles of No. 3/0 B. & S. gauge and 300,000 c. m. double braided weatherproof insulated aluminum cable to be installed between the sub-station of the Hydro-Electric Power Commission and the local sub-station in the City of Guelph. They have also recently supplied to the City of Calgary eight miles of 335,000 c. m. double braid weatherproof insulated cable to be used as electric railway feeders for the City of Calgary municipal electric railway.

Personal Mention

D. J. Stuart has been made manager of the city of New Westminster interurban line of the B. C. E. R., succeeding to D. J. Mcquarrie, resigned.

Thomas A. Bird, of the Bank of Toronto, and Alfred O. Tate, of the Tate Accumulator Company have been elected members of the board of directors of the Canadian Knowles Company, Limited, Toronto.

D. J. McQuarrie, local manager of the B. C. E. R. at New Westminster, has resigned. He has the record of having handled ten million passengers without a fatal accident to any one of them.

Frank R. Dark, of Detroit, at the present time employed with the Detroit United Railway, has been selected as power solicitor and business manager by the water commissioners of London, Ont. He will commence his duties at once.

H. D. G. Crerar, one of the electrical engineers of the Canadian Tungsten Lamp Company, Hamilton, was a passenger on the "Empress of Ireland." Mr. Crerar has been travelling in Europe for the past six months, investigating the tungsten question, and as he had the entree of some of the largest factories and laboratories in Europe, has come back with much useful information on all the very latest and most up-to-date improvements in electric lighting.

Mr. Henry H. Hadley Jr.

Mr. Henry H. Hadley, Jr., is town engineer of the town of Verdun, a description of the power and lighting system of which appears elsewhere in this issue. Mr. Hadley had charge of the construction of this plant and is now successfully operating it.

Recent Trade Publications

The Canadian Fairbanks Company, Limited, have just completed their general catalogue, which will be ready for distribution July 1. The catalogue is a very artistic production and should prove of general interest to every manufacturer and purchasing agent throughout Canada. It is profusely illustrated and shows the many and varied lines handled by the company.

The Westinghouse Electric Tailor's Iron.—A little booklet showing the construction of this apparatus and giving price list.

Westinghouse A.C. Fan Motors.—Description of their various type of fans for operation at 110 or 220 volts. Price list is included.

Verity's, Limited, Quarterly Report.—A short sketch of this company's progress during the past quarter year and drawing attention to their new manufactures.

Holland Trolley Supplies.—Catalogue A, issued by the Holland Trolley Supply Company, of Cleveland.

Conduit Talk.—No. 123—by Canadian General Electric Company, Toronto.

The National Electric Lamp Association, of Cleveland, issues from time to time, interesting bulletins, from its engineering department coving the various phases or electric light progress. The ELECTRICAL NEWS is just in recept of a nicely bound set of the more recent bulletins, which contains much useful information.

The Atmospheric System of Steam Heating, published by the American District Steam Company, of Lockport, U.S.A., contains a carefully illustrated description of this company's system of steam heating which utilizes water vapor at practically atmospheric pressure. Simplicity of installation, low first cost, no noise, and economy in operation are all claimed for the system.

Swan Anchors—1910 Catalogue by the Hamilton Anchor Company, Hamilton, manufacturers of the Swan anchor for electric poles.

Quebec to Montmorency Falls.—Booklet issued by the manmanagement of the Quebec Railway, Light, Heat & Power Company, illustrating parts of their system and points of interest in and around Quebec City.

National Governors.—Bulletin No. 390, issued by the National Brake & Electric Company, of Milwaukee.

Graduates in Electrical Engineering

The names of this year's graduates in the Department of Electrical Engineering, in the Faculty of Applied Science for Toronto, McGill and Queen's Universities, both pass and honors, follow. In the honor lists the particular subject or subjects in which honors were obtained are printed after the candidate's name.

McGill University.

Honors.—G. K. Boright, electrical engineering laboratory; T. Ferrier, electrical designing and electrical engineering; J. H. Fregeau, electrical designing; T. E. Gilchrist, thermodynamics; R. E. MacAfee, thermodynamics; A. A. McDiarmid, electrical designing; M. J. McHenry, electrical engineering, electrical designing, and electrical engineering laboratory, also British Association medal and prize; A. G. L. McNaughton, electrical engineering laboratory; D. A. Shanks, second prize for paper read before the Undergraduates' Society of Applied Science and prize for summer essay.

Pass.—G. K. Boright, B.A., A. S. Dawes, T. Ferrier, J. H. Fregeau, T. E. Gilchrist, P. C. Gill, D. A. Jackson, G. H. Kohl, W. A. Landry, R. E. MacAfee, G. A. MacDiarmid, J. H. Macdonald, M. J. McHenry, A. G. L. McNaughton, R. J. Needham, G. D. Powis, R. H. Reid, D. A. Shanks, R. V. Slavin, S. Sweetnam, H. H. Vroom.

Toronto University.

Honours.—Adams, O. F.; Cale, W. C.; Dobson, W. P.; Irwin, W. J.; MacTavish, H. J.; McKim, L. R.; Merriman, H. O.

Pass.—Cockburn, L. S.; Code, A. C.; Cole, C. R.; Evans, W. J.; Fairlie, H. W.; Ferguson, J. W.; Fletcher, F. T.; Flint, T. R. C.; Goodeve, V. S.; Graham, E. B.; Hickling, F. G.; Hinch, E. F.; Jamieson, E. A.; Lawler, E. R.; Lee, R. G.; MacMurchy, H. G.; Mills, P. E.; Morgan, J. P.; Nash, J. C.; Palmer, C. E.; Parker, G. C.; Pearce, K. K.; Redfern, B. J.; Ternan, E. A.; Thompson, R M. A.; Van Allen, K. M.; Watson, M. B.; Woodley, G. E.

Queen's University.

Pass.—A. J. Arthur, S. H. Buller, V. W. Crawford, B.A., J. V. Dobson, G. F. Drewry, E. S. Frost, M. S. Madden, E. S. Malloch, R. F. Ockley, K. F. A. Williams, B.A., J. H. Young.

Montreal, Quebec and Eastern Canada

Montreal Still Struggling With its Lighting Problem. Shawinigan Co. at Work on New Extensions. Twenty h.p. Plant for Rapids Prince

Montreal and Its Street Lighting Problem.

A settlement of the account which Montreal Light, Heat & Power Company has had outstanding against the city of Montreal for street lighting seems likely to be reached in the near future. The company's account, which has been accumulating since January 1st, 1909, now totals upwards of $200,000. The civic law department's suggestion to the Board of Control that the whole question be submitted to arbitration has found favor with both of the interested parties. In this arbitration Prof. L. A. Herdt, of McGill University, will represent the city and, according to Mr. J. S. Norris, general manager of the Montreal Light, Heat & Power Company, Mr. R. S. Kelsch will look after that company's interests. The third and neutral party will in all probability be agreed upon at an early date.

The Board of Control will soon call for tenders for city street lighting, and the competition for this contract promises to be exceedingly keen. When interviewed by a representative of the ELECTRICAL NEWS Mr. J. S. Norris denied the report that his company would not tender on the lighting contract of Montreal's streets. "We feel sure that the 4 ampere magnetite arc lamps will give the city the most efficient service,'' said Mr. Norris, ''but we are ready to tender on any style of lighting the specifications may call for''

Arrangements have practically been completed between the Power Company and the Board of Fire Underwriters whereby the former agree to refuse to connect up any services unless the Underwriters' certificate showing that the work has passed inspection is produced. This report was confirmed by both Mr. Norris of the Power Company and Mr. Hadrill of the Underwriters' Bureau.

Large Wiring Contracts Awarded

The contract for power and electric lighting wiring of the new workshop which the Dominion Bridge Company of Lachine are erecting here has been awarded to Messrs. W. J. O'Leary & Company. Approximately 1,000 horse-power in motors will be installed and the wiring will be in conduit. This company have also secured contract for lighting St. Patrick's Church, Montreal, and this will also be enclosed in conduit. A unique feature of the latter work is the employment of an indirect system of illumination, so arranged that the lamps will be invisible from the interior of the church. This is made possible by the special construction of the church windows, which are set in quite a distance. They have also secured the contract for the wiring of the new "Magic'' Apartment House in course of erection in Montreal. Several novel features are included in its construction, and this company's contract provides for special wiring for cooking apparatus and modern telephone and bell systems.

Montreal Street Railway Company.

Plans of the new car barns of the Montreal Street Railway Company will soon be ready. They are being prepared by Messrs. Marchand & Haskell, architects, and call for the construction of a building costing in the neighborhood of $1,000,000. A new solid steel car, the first of its type and only just recently placed in commission by the Montreal Street Railway Company, was destroyed by fire at Dominion Park on Victoria Day.

The marriage of Mr. Patrick Dubee, the popular secretary of the Montreal Street Railway Company, to Miss B. Dineen, daughter of Mr. M. Dineen, a prominent Montreal contractor, was celebrated in this city on June 28th. The Canadian Street Railway Association, in a recent annual session at the Windsor Hotel, showed their appreciation of Mr. Dubee's energetic services to the Association's executive by presenting him with a beautiful diamond stick pin and congratulatory address.

The marriage of Mr. Samuel Thomas Dixon, an assistant inspector of the Montreal Street Railway Company, to Miss Jessie Gass took place in the early part of June at St. Paul's Church, Cobden, Ontario.

Current Notes.

The Denis Advertising Signs, Limited, have erected a novel electric sign at the corner of St. Catherine street and St. Lawrence boulevard for the Francais Theatre Company. This sign is 17 feet high by 35 feet long. The letters are 18 inches and two feet high. At one end of the sign a realistic representation of a clown juggling a barrel with his feet is shown by a studded light effect.

The recent destruction of the Herald Building on St.James street, which occasioned a terrible loss of life, was caused apparently either by the weakening of the walls or collapse of water sprinkler tower on the roof of the buildings. Fire broke out after the collapse and both the Montreal Light, Heat & Power Company and the Street Railway Company were active in removing power wires which obstructed or hindered the firemen.

A 20 horse-power lighting plant is being installed in the new "Rapids Prince,'' now in course of construction at Toronto for the Richelieu & Ontario line. The Canadian Westinghouse Company, Limited, are supplying the equipment and the installation is being designed and supervised by Mr. J. D. Lachapelle. He is also performing a similar service on two new boats to be built for the Windsor Car Ferry Company at Quebec.

The Shawinigan Water & Power Company have commenced the construction of their new bulkhead at Shawinigan Falls. This is the addition to the present concrete bulkhead which is designed to furnish an additional 75,000 horse-power. The new power house will not be proceeded with until next year.

Mr. Guy M. Gest was in Montreal from New York during the month and spent some time at his recently opened office in the Power Building.

The Sayer Electric Company on June 27 opened an office at No. 1 Wellington street, Sherbrooke, Que., and will carry an extensive stock of up-to-date electrical supplies and fixtures.

Messrs. Lowden & Mead have opened an office at 13 Bleury street for the sale of electrical specialties.

We are pleased to note Mr. Brandeis' appearance at his office after a rather serious illness.

Mr. C. G. Matthews, for a number of years a member of the Electrical Repair & Contracting Company, has severed his connection with that firm and is at present in New York. Mr. Matthews was a member of the Electrical Association, Province of Quebec, at the time of his removal being a member of the Executive Committee.

Messrs. Plews & Laurin, consulting engineers, are now located with their testing laboratories at the corner of Bishop and Dorchester streets. With a five years' lease still to run the firm removed from the doomed Herald building about one month ago, owing to the Herald Printing Company requiring all their premises.

The J. L. Mott Iron Works, formerly 83 Bleury street, have secured new and extensive premises at 138 to 140 Bleury street.

The officials of the Canadian Light & Power Company with a party of friends visited the works in course of construction at St. Timothee and Valleyfield on Friday, June 3rd. They returned very favorably impressed with the excellent progress made towards the completion of this large project.

The F. Canac-Marquis glue factory, Quebec City, is shortly to be operated throughout by electricity. 220 volt, 2 phase, 60 cycle, current will be supplied by the Quebec Railway, Light, Heat & Power Company, and the Canadian Westinghouse Company will install the following squirrel cage type machines: One 20 h.p., two 15 h.p., one 10 h.p., one 7 1-2 h.p., two 5 h.p., and two 3 h.p. motors.

The reported amalgamation of the Canadian Light & Power Company with the Montreal Street Railway Company, brought the former's common stock up to 60, a gain of 25 points within the week.

Personals.

Mr. C. J. Young, late manager of the electrical department, Henry Morgan & Company, has accepted a responsible position with the Blaugas Company.

Mr. Fred. W. Evans, manager of the machinery department, Canadian Fairbanks Company, Limited, was married on June 8th to Miss Edna Hurd, of Toronto.

Mr. W. H. Reynolds is making an extended visit to the West in the interest of his firm, the Eugene F. Phillips Company.

Mr. Frederick E. Baldwin, Canadian sales manager for the Walpole Rubber Company, who has been in Montreal since September last in that capacity, died recently at his home at Melrose Highlands, Mass.

Mr. E. Irving, general manager of the Sunbeam Incandescent Lamp Company of Canada, Limited, Mr. Pritchard, factory superintendent, and Mr. T. Price, representative of this company, were recent visitors to Montreal.

Mr. R. Edwards, jr., of the Northern Electric & Manufacturing Company, Limited, has returned from a western trip.

Among the large firm representatives who visited Montreal during the past month are: Mr. Clapp, E. H. Freeman Electric Company, Trenton, N.J.; Mr. Ed. Mack, Crouse-Hinds Company, Syracuse, N.Y.; Mr. Johnston, Bongard Company, Toronto; Mr. Carman, Canadian Knowles Company, Limited, Toronto; Mr. F. F. Hooker, Sterling Telephone & Electric Company, London, England; Mr. Riggs, Standard Electric Time Company, Waterbury, Connecticut; Mr. R. W. Deane, Eco Magneto Clock Company, Boston.

Mr. Thomas Reed succeeds the late Mr. Baldwin as manager for the Walpole Rubber Company.

Mr. W. C. Ryan, electrical contractor, is now located at 13 Bleury street.

Mr. J. D. Lachapelle is consulting engineer for the town of Lachine, Que., to re-design their distribution lines.

Mr. C. W. Bongard, of Toronto, recently paid a visit to Montreal.

Mr. Earnest H. Foster, member American Society of Civil Engineers and member of the American Society Mechanical Engineers, vice-president of the Power Specialty Company, of New York, was recently in Montreal. During his visit Mr. Foster was an interested inspector of the Westmount power plant and incinerator.

Mr. H. R. Mallison, secretary of the Canadian Light & Power Company, was so unfortunate in the early part of June as to sustain a compound fracture of his left leg by the overturning of a buggy in which he was driving while making an inspection of the company's works at Valleyfield. Mr. Mallison was taken to the Royal Victoria Hospital, and we are glad to report that he is now on the way to recovery.

Mr. Lawford Grant, president and managing director of the Canadian British Insulated Company, sailed from Quebec for England on the 18th of June via the Empress of Ireland, to confer with his principals regarding the question of establishing further Canadian offices, to more satisfactorily look after their increasing business interests. Mr. Grant expects to return on the new Royal Edward, sailing from Bristol on July 7th and arriving in Montreal the following week.

Mr. H. D. Johnson, E.E., C.E., has been appointed Toronto representative of the Canadian British Insulated Company. Mr. Johnston was formerly connected with the National Electric Construction Company of England.

Prof. Herdt has returned from Winnipeg. During his visit the contract for the 12,000 volt cable requirements for the Municipal Electric Department was awarded to the Northern Electric & Manufacturing Company, Limited, of Montreal. The contract for the installation of same was awarded to Mr. Guy M. Gest, Montreal and New York.

Mr. R. M. Wilson, chief engineer of the Montreal Light, Heat & Power Company, was appointed third vice-president of the "Power Transmission Section" of the National Electric Light Association, at their annual convention recently held in St. Louis.

Electrification of Transcontinental R. R.

Easily Possible in Ontario 2,000,000 H. P. within Radius of One Hundred Miles. Waterpowers Located in Accompanying Map

By L. V. RORKE*

The electrification of steam railways is daily becoming a question of more vital importance and the realization of this more ideal mode of transportation seems, in the more favored sections of Canada, to be close at hand. In view of the comparatively little information that has, up to the present, been available to electrical engineers, concerning the water powers in the northern part of Ontario, through which a new transcontinental railway system is now being constructed, the accompanying map and table of water powers with a few explanatory remarks, will be of interest.

The Grand Trunk Pacific will have a length of over 1,000 miles in Ontario, and, with the exception of some 90 miles of this, will run north of the watershed which separates the north flowing river system emptying into Hudson's Bay from the shorter rivers flowing south into the Great Lakes, Georgian Bay and the Ottawa river. This height of land is represented on the map. The total area included in this northern slope in Ontario is approximately 100,000 square miles. It is bordered on the north by the Albany river, flowing east into Hudson Bay, and the English river flowing west into the Winnipeg river, as shown. The whole area of this northern slope and particularly the eastern section, is well served by rivers, the largest of which are the Abitibi, Mattagami and Missinaibi, tributaries of the

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*Inspector of Surveys, Department of Lands, Forests and Mines, Ontario.

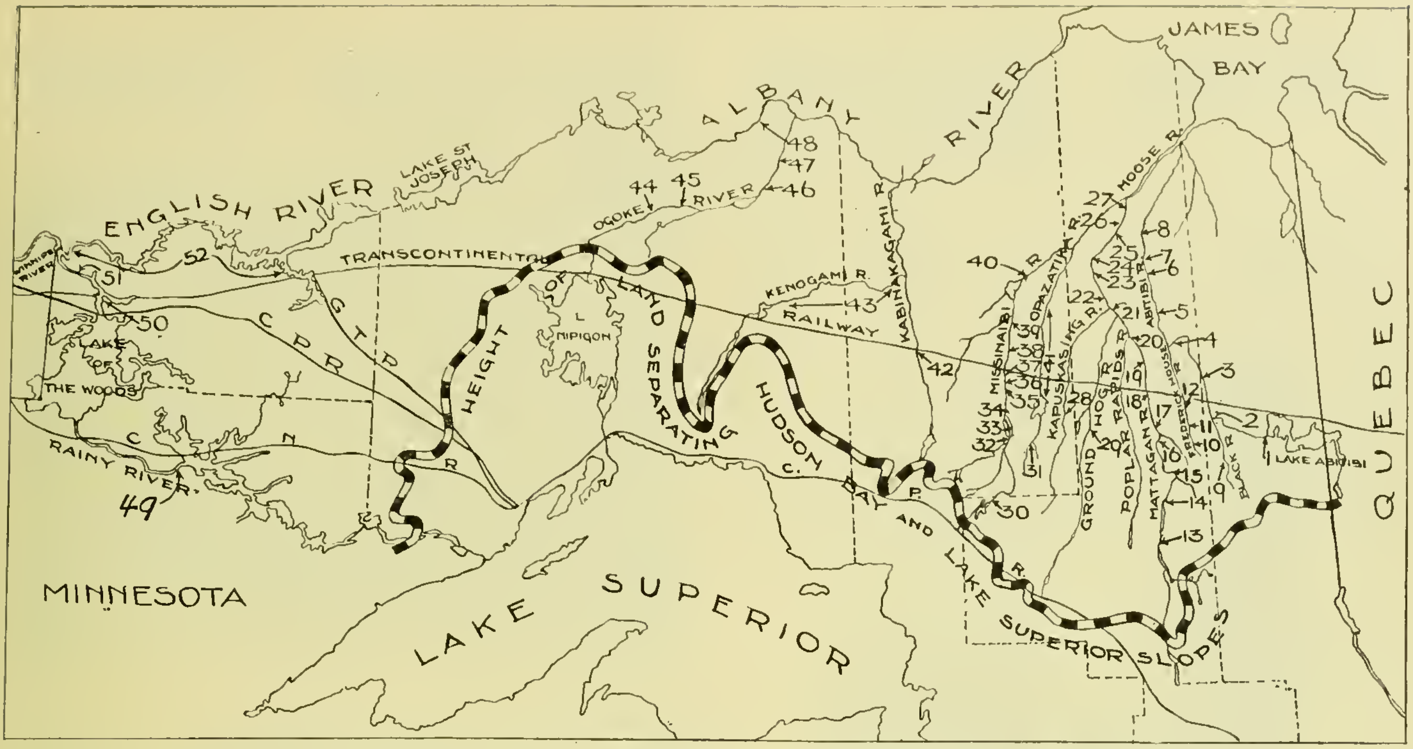
Moose river; the Kabinakagami and Ogoke, tributaries of the Albany, and the English, Winnipeg and Rainy rivers, the latter of which constitutes the western border line between Canada and the United States.

These rivers almost without exception are rich in rapids and waterfalls. Not counting the small falls of about 5,000 h.p. and under, which abounds in this area, a very conservative estimate of the available power places the amount at 2,000,000 h.p. The value of this immense amount of power in the scheme of transportation becomes all the more realizable when it is stated that every one of these falls is within a radius of 100 miles from the government road—a distance which offers little obstacle to modern engineering practice. Much of the land here is also well wooded, well supplied with coal of lignite composition and of excellent quality for agricultural purposes.

The detailed list which follows is believed to represent, within very close limits, the most important water powers in this northern Ontario section. Indeed, in the cases cited, there can be little doubt that sufficient margin has been allowed to consider that the figures represent the amounts of power that may be delivered at the end of transmission systems of average length. Also, as before stated, account has not been taken of a large number of falls producing 5,000 h.p. or under. The figures given on the map are simply reference numbers. By referring to the same number in the appended table full information may be obtained in connection with any particular water power desired.

Water Powers on the Larger Rivers of the Northern Slope to James Bay, in the Province of Ontario.

Reference Number.	Name of Water Power and Location.	Natural Head in feet.	Approximate drainage Basin area in sq. in.	Estimated minimum flow, c. f. s.	Est. mean discharge under controlled storage c. f. s.	Minimum 24 hour h.p. under natural bow.	Minimum 24 hour h.p. under discharge control.
	ABITIBI RIVER.						
1.	Koochiching Falls and Rapids below........	50	5000	2000	5000	11000	28000
2.	Iroquois and Buck Deer Falls	20	6000	2400	6000	5400	13500
3.	Long Sault Rapids	75	6500	2600	6500	22000	55000
4.	Kettle Falls and Rapids	10	7000	2800	7000	3200	8000
5.	3 Carrying Rapids	25	9500	3800	9500	10600	26500
6.	Lobstick Rapids	15	9500	3800	9500	6400	16000
7.	Series of Rapids above New Post...........	100	11000	4400	11000	49600	124000
8.	Otter, Sextant, Coral and Long Rapids.......	60	12000	4800	12000	31000	77500
	BLACK RIVER—Tributary of Abitibi River.						
9.	McDougall's Chute	14	800	320	800	500	1260
	FREDERICK HOUSE RIVER.—Tributary of Abitibi River.						
10.	High Falls, Mann Township	40	1000	400	1000	1800	4500
11.	Falls and Rapids, lot 12, cons. 4 and 5, Tp. Mann	30	1000	400	1000	1350	3400
12.	Rapids on lots 11 and 12, con. 5. Tp. Fournier	12	1200	480	1200	650	1640
	MATTAGAMI RIVER.						
13.	Kenogamisee Falls and Rapids	40	1000	400	1000	1800	4500
14.	Wawatian Falls	60	1000	400	1000	2700	6700
15.	Sandy Falls, Mountjoy Tp.................	50	2500	1000	2500	5600	14000
16.	Sturgeon Falls, Mahaffy Tp...............	16	3500	1400	3500	2500	6300
17.	Yellow Falls, Bradburn Tp...	18	3500	1400	3500	2800	7100
18.	Island Falls, Bradburn Tp..................	17	3500	1400	3500	2700	6700
19.	Smooth Rock Falls, Kendry	22	4000	1600	4000	4000	10000
20.	Fish Rapids	15	4000	1600	4000	2700	6800
21.	Cypress Falls	20	4500	1800	4500	4000	10100
22.	Devils Falls	12	12000	4800	12000	6400	16200
23.	Little Long Falls and Rapids	80	12000	4800	12000	43200	108000
24.	Great Rapids, Long Portage	100	12000	4800	12000	54000	135000
25.	Grand Rapids	40	12500	5000	12500	22000	56800
26.	Long Rapid Falls	150	12500	5000	12500	85200	213000
27.	Forks Falls	10	12500	5000	12500	5700	14200
	KAPUSKASING RIVER—Tributary of Mattagami.						
28.	Series of falls and rapids south of Nivens base line, aggregating	80	3200	1280	3200	11500	28800
	GROUND HOG RIVER—Tributary of Mattagami.						
29.	Series of falls and rapids south of Nivens base line	100	4400	1760	4400	19800	49600
	MISSINAIBI RIVER.						
30.	Brunswick Rapids	10	2500	1000	2500	1000	2600
31.	Green Hill Rapids	10	2500	1000	2500	1000	2600
32.	St. Peters Falls	15	3000	1200	3000	2000	5100
33.	St. Pauls Falls	20	3000	1200	3000	2700	6800
34.	Albany Falls	10	4500	1800	4500	2000	5100
35.	Beaver Portage	12	5000	2000	5000	2700	6800



Map showing location of larger Water Powers on the Northern Slope of Ontario.

36.	Sharp Rock Falls	10	5000	2000	5000	2200	5600
37.	Crow Rapid	17	5500	2200	5500	4200	10500
38.	Island Chute	10	5500	2200	5500	2500	6200
39.	Tom King and Kettle Rapids	20	6000	2400	6000	5400	13600
40.	Conjuror's Chute and Hell's Gate	250	6500	2600	6500	73800	184600
	OPAZATIKA RIVER.—Tributary of Missinaiti.						
41.	Breakneck Falls and Rapids above	150	2500	1000	2500	17000	42600
	KABINAKAGAMI RIVER—Tributary of Albany River.						
42.	1st Outlet Falls	35	1000	400	1000	1600	4000
	2nd Falls and Rapids	25	1100	440	1100	1200	3000
	3rd Falls and Rapids	15	1200	480	1200	800	2000
	4th Falls and Rapids	20	1400	560	1400	1200	3000
	5th Falls and Rapids	40	1500	600	1500	2700	6800
	6th Falls and Rapids	12	1600	640	1600	800	2200
	7th Falls and Rapids	25	1700	680	1700	1900	4800
	8th and 9th Falls and Rapids	18	1800	720	1800	1400	3600
	10th Falls and Rapids	30	2000	800	2000	2700	6800
	11th, 12th and 13th Falls and Rapids	75	2100	820	2100	7400	18700
	14th Falls and Rapids	10	2300	920	2300	1000	2600
	15th Falls and Rapids	17	2500	1000	2500	1900	4800
	KENOGAMI RIVER.—Tributary of Kabinakagimi River.						
43.	Kenogami Falls	25	1000	400	1000	1100	2800
	3rd Portage Falls	25	1500	600	1500	1700	4200
	7th Portage Falls	32	1800	720	1800	2600	6500
	10th Portage Falls	12	2300	920	2300	1200	3000
	11th Portage Falls	70	2500	1000	2500	8000	20000
	OGOKE RIVER—Tributary of Albany River.						
44.	Amy Falls	30	8000	3200	8000	10800	27000
45.	Rapids below Amy Falls	10	8000	3200	8000	3600	9000
46.	Burton's Falls	50	12000	4800	12000	27200	68000
47.	Rapids above mouth of Whitefish River	50	12000	4800	12000	27200	68000
	ALBANY RIVER.						
48.	Martin's Falls	30	12000	4800	12000	17800	44600
	WINNIPEG RIVER.						
49.	Koochiching Falls	23	14000	5600	14000	14400	36000
50.	Kenora Falls	18	27000	10800	27000	22000	54000
51.	White Dog or Islington Falls	50	27500	11000	27500	62000	155000

52. ENGLISH RIVER—Tributary of Winnipeg River.—Has a drainage basin of 22,000 square miles with minimum flow of 9,000 c. f. s. at outlet. The several large rapids and falls on this stream up as far as the N. T. C. Railway crossing, where the minimum flow is 3,200 c. f. s., aggregate a total head of 150 feet, which will give a minimum efficiency of 125,000 horse power.

Toronto's Electrical Distribution System

Underground in Congested Sections—Single Pipe Duct Used—Wiring Diagram of Typical Substation

By H. C. Barber.

On January 1st, 1907, by a vote of the ratepayers, the municipality of Toronto was authorized to contract with the Hydro Electric Power Commission of Ontario for 10,000 h.p., to be delivered to the city at 13,200 volts from the Commission's station located as near the centre of the city as it was possible to bring the 110,000 volt lines. At this time there was some agitation against the city's contracting for 10,000 h.p., as it was claimed that they had no demand for it for municipal power and lighting, and that it was not certain that they could dispose of this amount. For this reason the amount to be taken at first was cut down to 6,000 h.p., which can be readily used in the city's own power and lighting plants. In August the Council appointed K. L. Aitken, electrical engineer, to design and construct a system to distribute this power, Alexander Dow, of Detroit, being retained as consulting engineer. The design of the system was proceeded with at once, and has progressed steadily up to the present time.

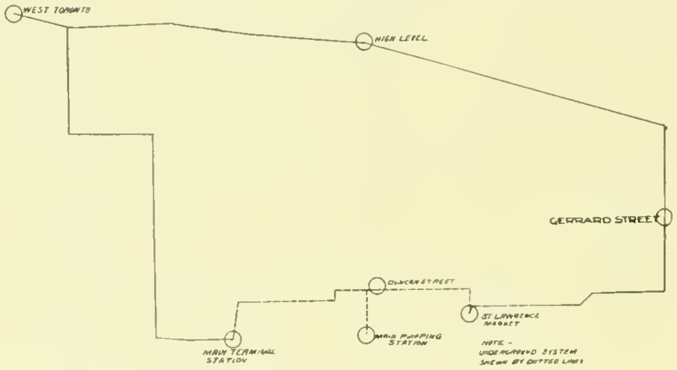


Fig. 1. Showing Location of Toronto's Substations.

From Figure 1 the location of the different sub-stations throughout the city may be seen, and a general idea of the underground and overhead lines obtained. The dotted lines represent underground transmission. The city is to be surrounded at present by a ring of six stations, all connected together, and where the load demands it having separate feeders running direct to them from the main terminal station. By using this system the danger of an interruption to the service is greatly diminished, as there will be three distinct lines by which the power may come from the terminal station to each sub-station.

The sub-station located at the main pumping station is for the use of the pumping motors only, this district being supplied with light and power from the Duncan street station. The equipment of this station consists of four 1,500 h.p. synchronous motors, for domestic service, and two 1,500 h.p. induction motors for fire service.

The high level sub-station is to be used for distribution of light and power, as well as for operating the pumping motors located here. These motors are of 500 h.p., eight in number, four being synchronous for domestic pumping and four induction motors for fire purposes.

The lighting load for the island will be carried from the substation at the filtration plant. There are two 225 h.p. synchronous motors for the Island service, and a number of smaller capacity induction motors for the filtration plant. It is proposed to carry the lines to this station across the channel on steel towers about 150 feet high.

The Underground System.

All the main cables leave the terminal station underground. The line to West Toronto runs about half a mile to the west, where it crosses under the railroad tracks; it then runs notherly. The main lines cross under the tracks (Fig. 2 shows the method of laying the duct at this crossing) in two sections of 18 ducts each, and then run right through the business district feeding Duncan street, the main pumping station and the St. Lawrence Market sub-station. These lines will be completed, it is expected, about the middle of July. The conduit is being supplied by the American Sewer Pipe Company, of Akron, Ohio.

Teh accompanying cut, fig. 2, shows clearly the method of laying the duct for these cables. Each run is enclosed with three inches of concrete, and rests on a bed of concrete four inches thick. The minimum distance from top of duct to road level is 34 inches. The duct is known as single tile, and comes in sections 18 inches long, 3 5-8 inches inside diameter.

Manholes are located at intervals of approximately 300 feet throughout the entire length of the system, and are placed at the intersection of cross streets where possible, to facilitate the extension of the system on these streets when desired. The greatest distance between manholes is about 400 feet, as beyond this it is very difficult to pull in the cables. The manholes are of brick construction (Fig. 3), with a concrete roof, in which a cast iron frame supported by I beams is set to carry the covers. Each manhole has a connection to the sewer to provide drainage. age.

Cables.

The cables for the main feeders consist of three conductors

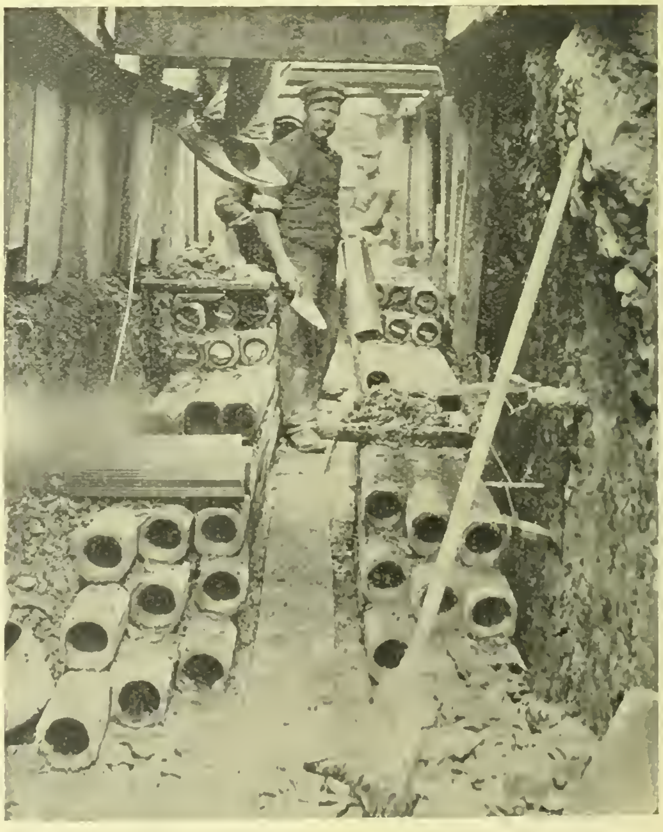


Fig. 2. Laying Duct for Toronto Underground Distribution.

of No. 3/0 B. & S. gauge. Each conductor is wrapped with manilla paper, treated with insulating compound to a thickness of 7/32 of an inch. The three conductors are then covered with another wrapping of 7/32 inches of paper, the whole being covered with a lead sheath 1/8 inches thick; the lead serves as a protection to the paper, and prevents the entrance of water. The cable is being supplied by the Canadian British Insulated Company, who are also pulling it into the ducts and making the splices.

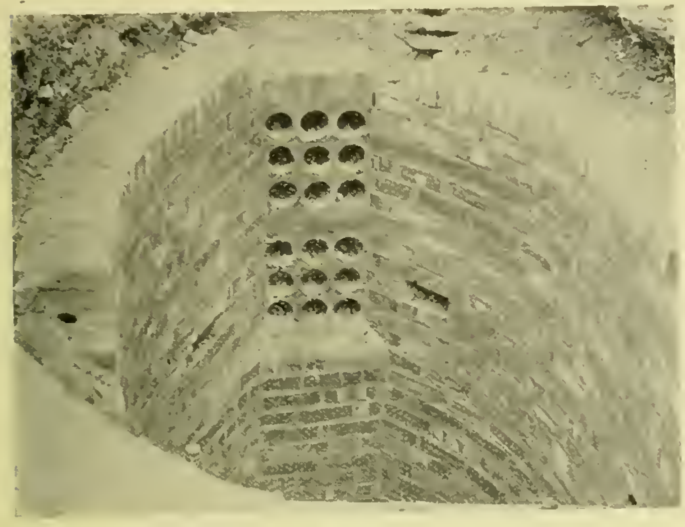


Fig. 3. Manhole showing Ducts. During Construction.

Sub-Stations.

The location of the various sub-stations is shown by the circles on the map (Fig 1). It will be noted that starting from the terminal station they form a complete ring around the outskirts of the city, two 13,200 volt lines running through each one. As the load of a station passes beyond the carrying capacity of the ring feeders, separate feeders will be installed connecting it directly to the terminal station. Fig. 4 shows a typical sub-station and switching layout, providing for two direct feeders from the terminal station.

The arrangement of the ring feeders by means of which any section of line may be cut out without shutting off the station, is clearly shown. In case of trouble on a line, the switches in the two adjacent sub-stations are thrown out, each station still being fed from the other side of the ring.

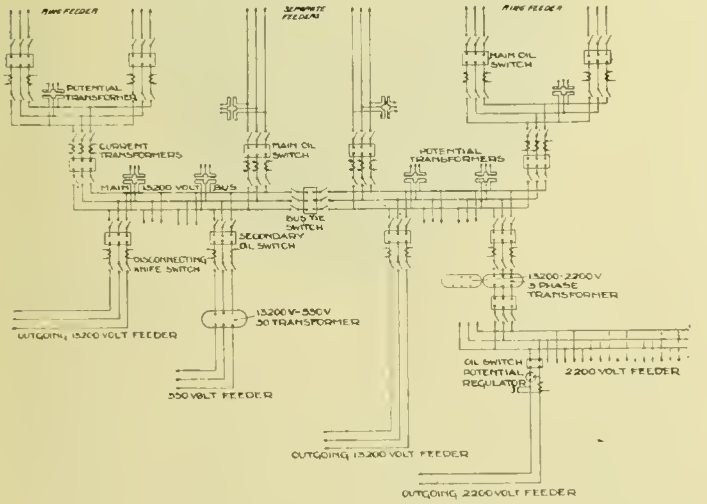


Fig. 4. Wiring Plan of Typical Substation.

The 13,200 volt oil switches are provided with disconnecting knife switches on both sides, so that they may be entirely isolated to allow for repairing and adjustment. Each 13,200 volt switch is also provided with two current transformers which operate the ammeters, power factor indicators and relays. The main switches feeding the bus have three current transformers, the extra one being required to operate the integrating and recording wattmeters, which measure the input of power to the station. All 13,200 volt switches will be electrically operated, those on incoming lines being motor operated, and the secondary switches being solenoid operated. Potential transformer sets consisting of two transformers are provided for each incoming feeder, and each section of the main bus has also two sets. The potential transformers operate the voltmeters, and are necessary for the operation of the power factor indicators and the wattmeters.

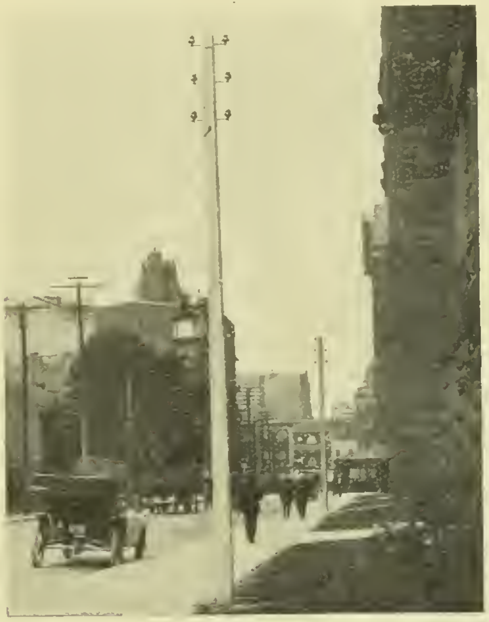


Fig. 5. Concrete Pole with which experiments are being made—Note lamp supported from left side.

Transformers.

In the present installation three phase transformers of the oil insulated water cooled type are used throughout. They range in size from 1,500 k.w. for the main pumping station to 300 k.w. for the smaller sub-stations; they may be replaced later by banks of single phase transformers having a larger capacity, and removed to other stations. They are of two different ratings, viz.: 13,200/2,200 volts and 13,200/550 volts. The 2,200 volt service will be principally for lighting, and the 550 for power. The leads from the 550 volt service will run directly from the station to the network, the 2,200 volt will feed a bus in the station. This bus will serve sub-feeders, each being provided with a voltage regulator. These feeders will then run to different distribution centres, and feed their separate outworks.

Recent Trade Publications

National Motor Driven Air Compressors—Publication No. 387, issued by the National Brake & Electric Company, Milwaukee. The various parts of the machinery are discussed in turn, and the working of the assembled parts explained. A description of a number of portable air compressors is also given. Tables are appended giving the specifications of their various sizes of compressors.

Single-Phase Reaction Motor.—Circular No. 29, issued by T. Harding Churlton & Company, Leeds, England; also No. 28 descriptive of polyphase induction motors for two-phase or three-phase currents, and No. 27, on single-phase a.c. induction motors; also a descriptive booklet containing many useful notes on alternating electric current and induction motors, price, one shilling.

Telephone Department

The Southern Countries Telephone Convention —Independent Movement Gathering Strength—Interesting Papers and Addresses at Waterford

The independent telephone movement in the Lake Erie counties of Ontario was given an encouraging impetus on June 3rd, when the second annual convention of the Southern Counties Telephone Association was held in the Town Hall, Waterford. A large number of delegates representing many companies between the Detroit and Niagara rivers attended.

Francis Dagger, secretary-treasurer of the Canadian Independent Telephone Association, the telephone expert who assisted the governments of the western provinces in their public ownership enterprises, was present and delivered an excellent address, and Samuel Charters, M.L.A., whose Ontario Telephone Act was one of the features of the last session of the Legislature, discussed the independent problem in a masterly manner. His remarks upon the government ownership outlook were of special importance. Dr. Doan, of Harriettsville, contributed a thoughtful paper, and the discussions which followed these addresses, as well as the resolutions offered by the committees, were all of a helpful nature.

President T. R. Mayberry, M.L.A., of Ingersoll, was unable to attend on account of the death of his father, and in the absence also of Dr. J. W. Crane, the vice-president, Dr. Doan was appointed chairman. At the morning session the reeve of Waterford, J. J. Church, delivered an address of welcome. He spoke of the interest Waterford had in the independent telephone movement and assured the delegates that the council and town appreciated the honor of the association holding its convention there.

The reeve was supported by P. George Pearce, president of the Board of Trade and editor of the Waterford Star. In speaking of the industrial hopes of Waterford, he pointed out that between $80,000 and $100,000 was invested in the telephone business there. Waterford was proud of its telephone factory and of being the centre of a flourishing rural telephone business, having 900 subscribers.

The addresses of welcome were suitably replied to by Mr. Dagger.

Hugh P. Innes, M.L.A., gave an interesting historical sketch of the county and concluded by contrasting the life of the pioneer with that of the farmer of to-day. He called attention to the advantages of the telephone and the progress of electricity, with special reference to the interest which the Provincial Government was taking in these matters.

The Dominion Telephone Company extended an invitation to the delegates to visit its factory. Nominating and resolution committees were then named and an adjournment made until the afternoon.

In opening the afternoon meeting Dr. Doan as chairman made a few remarks in lieu of the president's address, in which he asked the representatives of the different companies when making a report to their board that they urge upon it the necessity of establishing a toll charge for trunk connections with the systems of other companies. Even if they did not make it more than 5 cents or 10 cents, it would save trouble and dissatisfaction in the future. He also called attention to the practice of using too small poles when building rural lines, and stated that the majority of companies fall into this mistake. For instance, 20 foot 4 inch top poles would not carry more than two wires at the utmost, where by putting in 25 foot 5 inch top three or five circuits could be strung. He also referred to the necessity for an amendment to the Assessment Act which would place the assessment of rural telephone lines upon a more equitable basis.

After the secretary, Mr. W. C. Lundy, presented his annual report, which showed a membership of 42 last year, Dr. Doan read a very practical paper on the independent telephone movement. His address was in part as follows:

Dr. Doan's Paper

"The day has not come when any single company can afford to stand by itself, fight its own battles and solve its own problems. The key note to success in our business is co-operation. We may have our individual notions as to the best policy to pursue in the conduct of our own business, but if we are to succeed as a system there are certain general policies which none of us can ignore. The day for fighting and scrapping among rural telephone companies should be past. We have reached the time for reconstruction and progressive management. The greatest porblem before us is the putting of our plants upon a solid foundation financially, and the giving to the public a good service.

"While I do not wish to anticipate what Mr. Charters has to say relative to the telephone bill passed last session in the Legislature, I would call your attention to one or two of the principal objects of the Act.

T. R. Mayberry, M.L.A.
President Southern Counties Telephone Association

"We should endeavor to secure trunk line connections upon reasonable terms, with our neighboring telephone systems. Petty jealousies should be forgotten and the extension of the usefulness of our system by communication with our neighbors made one of our first objects. We are now subject to the Ontario and Municipal Board, and any subscriber can demand of our company a physical connection with our neighboring telephone system, and we failing to agree upon terms, the Board has power to order such connection upon terms and conditions such as it may deem advisable. We should be big enough and broad enough to do what is right without being forced to do so by public opinion.

"To have a satisfactory interchange of business, the local telephone service must be good. The telephones must be well installed, and all line joints well made. It should be the primary object of every company to have its lines well built, telephones properly installed and batteries well maintained.

"I would urge upon all the delegates present to see that your company becomes a member of the Canadian Independent Telephone Association. This association has done good work, but not nearly what it could have if your company had given it the support which it is in your interest to do. I would urge upon you the advisability of taking this step at once.

"Another matter is that of adequate rates for telephone service. I feel sure that there are some companies who are not raising enough money to keep their plants in good condition. We should urge upon our independent companies the necessity of establishing rates which will enable them to give a good reasonable service. Get your line well built and charge a price that a reasonable man should be willing to pay. We should learn and understand this phase of the telephone business. A good rule is that each man should pay for what he gets, and all should be made to pay alike for the same service. The point that I lay stress on is that all companies should strive to give the very best service possible and that they should be compelled to charge every patron alike for that service."

Mr. Charters Congratulates Association

In a very inspiring address, which gave evidence of an intimate knowledge of telephone conditions, Samuel Charters, M.L.A., after a sympathetic reference to the cause of the president's absence, said he accepted the invitation to attend the meeting as he was in hearty accord with the work of the association, and because he would like to have a part in any movement tending to increase the happiness and prosperity of the people. He congratulated the association upon the success of its efforts and phophesied that they would succeed beyond their highest expectations.

"I would like to remind you," said Mr. Charters, "that the telephone is only 35 years old and for 25 years it has been under one corporation. The independent movement was started ten years ago, and has made wonderful progress during so short a period, since ten years is not a very long period in any movement. No movement has made more progress than that with which you are connected. By creating competition you have aided the people. It is not so long ago that people were willing to agree that telephones were useful for a business man, but it is very well known to-day that the telephone is as necessary to the success of an up-to-date farmer as it is to a man in the city. You have done more than that, since you have placed the monopoly on the defensive. You have extended lines out into the rural districts, cut the price and established conditions which make it possible for anyone in the country to secure telephone service. You have been instrumental in the establishment of 400 companies, associations and systems which have supplied telephones and are supplying telephones to upwards of 40,000 subscribers. You can supply 40,000 more and still have a small number in proportion to the population. In addition to that you have had a great deal to do in creating a public sentiment which was sufficiently strong to influence the Governments of Manitoba, Saskatchewan and Alberta to buy out the Bell Telephone System in those three provinces and place them under government control."

"Many people thought that the action of the Western provinces in securing the control and ownership of the Bell System should be followed by the other provinces of the Dominion. Eight or ten years ago the sentiment for public ownership of telephones was very strong, stronger than at the present time. In 1903-04 that sentiment was sufficiently strong to secure the co-operation of so good a man as Sir William, now Chief Justice Mulock, who endorsed the public ownership of the telephone and had a commission appointed. When the evidence was in the Dominion Government balked at the big outlay required, Sir William soon afterward retired, and the national telephone scheme has not been heard of since. In 1909 Hon. I. B. Lucas, M.L.A., was possessed of the same idea for the Province of Ontario and introduced a resolution asking for jurisdiction to expropriate the telephone lines. Mr. Lucas' idea was for the Government to provide the trunk lines. Sir James Whitney, however, held the opinion that as the Bell Company did not want to sell, the price would be too high, and his opinion prevailed, as it generally did in these matters, and the resolution was withdrawn."

In regard to the telephone legislation that had been passed, Mr. Charters stated that any municipality on the petition of a number of ratepayers might establish a municipal system. The Ontario and Municipal Board now had jurisdiction over the telephone companies, but in order to render the machinery more effective a competent man should be placed in charge of telephone matters.

Referring to the Ontario Telephone Act, which he had introduced at the last session, while a number of individuals were responsible for the measure, they were especially indebted to Mr. Dagger, Mr. Mayberry and Mr. Lucas. Mr. Lucas more than any one had been instrumental in getting the Bill through. The chief object of the Bill was to have a central authority of some kind, and the Railway Board was decided upon. He pointed out the importance of section 11, that no agreement between any two companies was valid unless approved by the Board. The speaker urged on all companies the wisdom of submitting all agreements to the Board before signing them. The Board was anxious to prevent conflicts and to help the independent companies.

The attitude of the Ontario and Dominion Governments showed that it was not likely that either would take over the telephone system. The next step was to proceed with municipal systems and very speedily they would build up a chain of systems which would make independent long distance connection possible. Mr. Charters spoke at some length on this phase of the question, and concluded by hoping that in another year the independent companies would have doubled the number of their subscribers.

The General Secretary's Address

Following a discussion of Mr. Charters' address, the delegates enjoyed an instructive talk by Francis Dagger. Mr. Dagger said:

"I have enjoyed very much listening to the inspiring address of the last speaker, and I am sure you will all agree that we are under a deep obligation to Mr. Charters for the pleasure which he has offerded us to-day. That, however, is not all. If it had not been for Mr. Charters and Mr. Lucas and the loyalty they showed on behalf of the Ontario companies, the recent telephone legislation would never have become law. There was a time when in my opinion there was a very serious chance of it being either defeated altogether or so mutilated as to be absolutely useless for the objects that we were seeking to gain. I think the independent telephone operators and farmers in Ontario using telephones owe a very great debt to the Provincial Government and to Mr. Lucas and Mr. Charters in particular for their work in helping to relieve the people from some of the evils of telephone monopoly.

"We are assembled here to-day as representatives of the independent telephone movement. This movement has been credited with existing for the purpose of ruining the Bell Telephone Company. That is the statement made by prominent Bell officials. I would like to take the opportunity of denying this assertion. The independent movement exists for the purpose, not of ruining the Bell Company, but of safeguarding the interests of the people against tetephone monopoly, by the development of a service which is not hampered and restricted in the way that it was before the inception of that movement. The birth of the independent telephone movement was the direct result of the failure of the Bell Telephone Company, not only in Canada, but in the United States, to respond to the request of the farmer for telephone service. The farmers are the wealth producers of this country, but when they asked the Bell Telephone Company for telephone service they were refused. Because this company did not reach out to them, the farmers commenced to provide themselves with the service which was denied them by the monopoly, and that was the beginning of the independent telephone movement.

"There seems to be an impression among certain companies that the title 'Independent Telephone Company' means opposition to the Bell Telephone Company and nothing more. That such a company exists for the sole purpose of fighting the Bell Telephone Company. That is not the meaning of the word independent at all. I think if independent companies would devote all their energies to their own business and carry on their work as if the Bell Company did not exist, that they would progress much more satisfactorily than they are doing at the present time.

"Among other definitions of the word 'independent,' which you will find in the dictionary, are the following: 'Not subject to the control of others,' 'Not holding or enjoying possessions at the will of others.' 'self-directing, 'self-commanding,' 'free.' Now you as owners of the telephone properties which you have built by your own efforts and with your own money, should live up to these definitions. Do not allow yourselves to become subject to the control of others, and be careful that you do not hold or enjoy possession of your property at the will of another, to wit, the Bell Telephone Company. In the management of your business see to it that under all circumstances you retain the right to be 'self-directing,' 'self-commanding' and 'free.' I would like you to bear this in mind when you are approached by the Bell Telephone Company in the matter of making arrangements for interconnection. It is not the part of the association to dictate to its members as to what they are to do or what they are not to do in the way of connecting with the Bell, but independent companies should be careful in making these agreements to see that they retain the right to control their own property, to extend their service wherever it may be necessary in their own interests, and that they do not allow themselves to be led into signing any contract under which they become merely one of the hired servants of that organization.

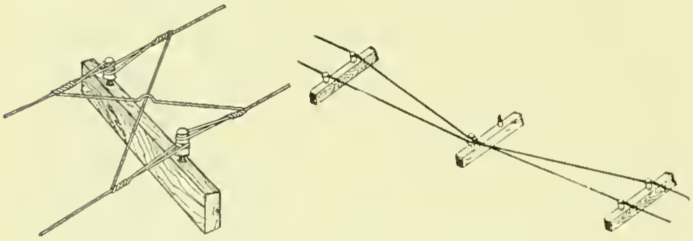


Fig. 1 Fig. 2
Methods of Transposing—See next page

"Many companies have to learn from experience that these contracts are not made in the interest of the rural telephone subscriber or the independent telephone system, but in the interest of the Bell Company. This company does not employ smooth-tongued agents to go round the country at great expense in order to protect your interests. They are looking after the Bell Telephone Company's interests, not yours, therefore you should be determined that in all your negotiations with that concern you retain your independence, but be independent, not in the sense that you are fighting the Bell Company, but because you mean to "have what you hold" and control your own property in your own way. Above all be careful that by entering into these agreements you do not strengthen private monopoly of the telephone service, for if you do this be assured the time will come when the people will revolt, and the government may be forced to take such action as would seriously effect the interests, not only of the Bell Telephone Company, but of those companies who have permitted themselves to become its satellites. I need not remind you that the electric power interests in Ontario, as a result of their monopolistic methods, are living in fear and trembling, because of the establishment of public ownership by the Hydro-Electric Commission of Ontario. If that time ever arrives in the telephone business the Bell Telephone Company will be too busy looking after its own affairs to care what becomes of you.

"Were it not for the existence of the independent telephone movement the business men in our cities and towns to-day would be paying from fifty to one hundred per cent. more for their telephone service and the farmer would be getting no telephone service at all. This is the work we have accomplished during the last six years. You have by your efforts made it possible for each farmer to have telephone service. You have also created conditions whereby, owing to competition or fear of competition in the larger cities and towns, the Bell Company has not ventured to raise its rates to a point which would increase its profits without increasing the service for the benefit of the people. This is one of the benefits an association like this has conferred upon the public. As secretary of the Canadian Independent Telephone Association I should like to see more of these sectional associations. I think myself that there should be in Ontario a dozen such associations as this. My personal opinion is that one great thing is lacking in connection with this telephone movement, and that is unity. The Bell Company is a united force working in the interests of one corporation from the Atlantic to the Pacific, not only in Canada, but also in the United States. Therefore, it is necessary that we all unite, for as units we are helpless. I want to impress upon you that you ought to get together and realize that you are fighting in one common cause, having only one interest, namely: to develop the telephone service in the particular district in which you are located. If the Bell Company once realizes the fact that you are united and that you will stand together at all times you will get more reasonable treatment from that corporation. You may need connection with the long distance lines, but you do not need that connection one whit more than the Bell Telephone Company wants your business. It wants your lines as feeders to its long distance service. Why, then, should this company dictate to you how you are to manage your business and charge you a toll in addition to what the public pays, before it will give you long-distance connection. You have the right to that connection and I will tell you why. In 1880 this company was given rights which no telephone company has had since, or will ever get again, namely: the right to place its poles upon every road and thoroughfare throughout the Dominion of Canada, and except where it has sold out these rights, as in the Western provinces, it holds them to-day. Even the cities of Toronto and Montreal could not refuse to allow the Bell Company to place poles on any of their streets. In return for such an exclusive and valuable privilege as this, I contend that you have the right to ask the Railway Commissioners to order this company to furnish long distance service to your subscribers, when requested so to do, upon payment of the ordinary tariff charged to the general public.

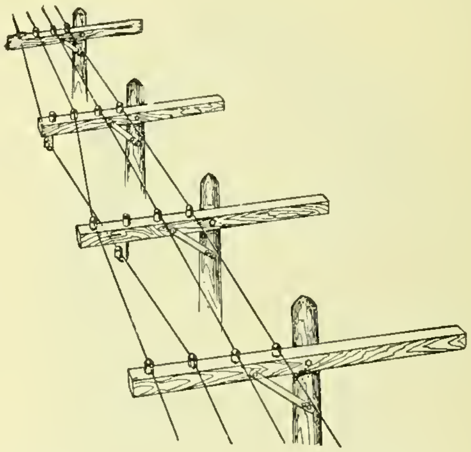


Fig 3—Methods of Transposing—See next page

In conclusion, you have a great work ahead of you. If Iowa, with approximately the same population, has 350,000 telephones, with more than one-half this number in the homes of the farmers, why should we in Ontario be content with the present development. There is ample room in this province to-day for half a million telephones. It is up to you, gentlemen, to do your part in reaching this ideal, and to go on with the good work until you have the satisfaction of seeing a telephone in every farm house in Ontario.

Resolutions Adopted

Mr. Dagger presented the report of the Resolutions Committee, and the following resolutions were carried unanimously.

(1) "Resolved, that this Association desires to express to their president, T. R. Mayberry, its sincere and heartfelt sympathy in his recent bereavement and the hope that he may be given strength to bear his loss with resignation, and hope for a meeting in the future."

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(2) 'Resolved, that this Association urges upon every owner of local or rural telephone systems or lines in Ontario the absolute necessity of combining for the purpose of protecting and conserving their interests as a whole."

And be it further resolved,

"That it is in the interest of every owner of local or rural telephone systems or lines that they should recognize their obligations to each other and refuse to enter into any agreements or arrangements which will have the effect of creating or strengthening any monopoly of the telephone service, and retarding the development of independent telephone systems in this province."

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(3) "Whereas many contracts have been entered into for interchange of service between the Bell Telephone Company and the owners of other telephone systems in Ontario upon terms which are discriminating and which have the effect of parcelling up the country for the purpose of maintaining a monopoly."

Therefore be it resolved,

"That this Association urges upon the Board of Railway Commissioners for Canada the necessity for such action as will make possible interchange of business upon equitable terms without restricting the development of independent telephone systems throughout the province."

And be it further resolved;

"That this Association respectfully suggests the desirability of a general order being issued by the Board which will enable independent telephone users to secure long distance service upon payment of the usual long distance tariff of the Bell Telephone Company, plus such terminal charge as the Board may deem fair and reasonable for communications terminating at points where local competition exists, and that a copy of this resolution be forwarded to the chief commissioner."

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(4) "Whereas at the last meeting of the Legislative Assembly of Ontario certain statutes were enacted dealing with telephone conditions in this province notably: The Ontario Telephone Act, 1910, and an Act to amend the Local Municipal Telephone Act, 1908."

Therefore be it resolved;

"That this Association records its unqualified appreciation of the action of the Provincial Government in enacting the before-mentioned statutes, believing that they will tend to assist in the development of telephone sysems in Ontario, more particularly in the rural districts and will render these systems immune from monopolistic control."

"And be it further resolved;

"That this Association in thus commending the Provincial Government ventures to express the hope that its action last session will be followed up by such further legislation and practical work as will eventually have the effect of placing a telephone in every farm house of the province, and further make posible intercommunication between every telephone user upon equitable terms free from discrimination and the control of private monopoly.

"And that the secretary be instructed to forward a copy of this resolution to the premier of Ontario."

Messrs. Taylor and Lounsberry moved and seconded a vote of thanks to the three speakers, and on the motion of Messrs. Boyse and Sneath, Brantford was chosen as the next meeting place, Ingersoll's representatives inviting them for the year following.

The officers elected are as follows: President, T. R. Mayberry, M.L.A., Ingersoll; 1st vice-president, George Taylor, Blenheim; 2nd vice-president, James Ross, Waterford; secretary-treasurer, W. C. Lundy, Waterford.

Approved Methods of Transposing Wires

The Electrical News receives frequent inquiries from telephone companies in various parts of Canada about many phases of telephone construction and operation. We are always pleased to give any information in our possession, or any that we may be able to obtain, to assist the younger or less experienced companies in making their systems entirely satisfactory to their customers. The following cuts indicate the various methods that may be followed in making transpositions of telephone lines by which means induction effects may be nullified. Without these precautions experience has shown that, on frequent occasions, electrical disturbances will seriously deteriorate the service and may result in temporarily putting the line out of commission.

Figures 1, 2 and 3 show various methods of transposing the line wires. In Figures 1 and 2 it will be seen that a double grooved insulator is used, shown more clearly in Fig. 4. The method of transposition used in Fig. 3 utilizes a different style of insulator, which may take the form of a one-pin bracket, as shown in this figure, or a steel 2 (or more) pin bracket, as shown in Fig. 5. This latter plan of transposing possesses the advantage of keeping the wires at a uniform distance apart throughout the system, thereby avoiding the risks of crosses or short circuits. It can be seen that wires crossed as in Figure 1 may easily be short circuited by a careless lineman at work or a limb falling, or even by a heavy snow or sleet storm.

Fig. 6 shows a typical method of making transpositions on ten pin cross arms. The transposition scheme for both the top arm and the second arm is shown. Where more than two arms are used, the third arm should be the same as the top arm and the fourth arm the same as the second arm. In other words, the odd numbered arms should be transposed alike and the even numbered arms should be alike. Where eight pin arms are used the trans-

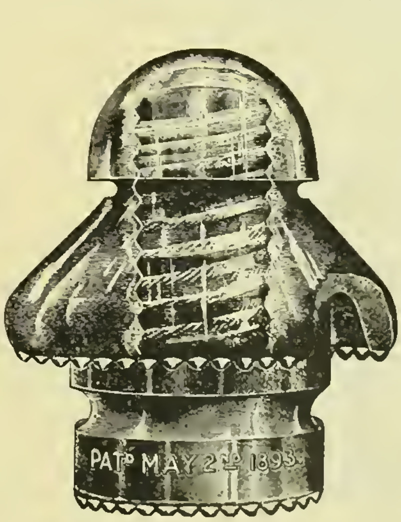


Fig. 4 Double grooved insulator

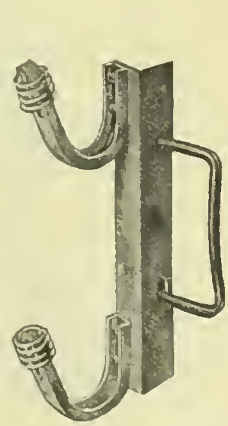
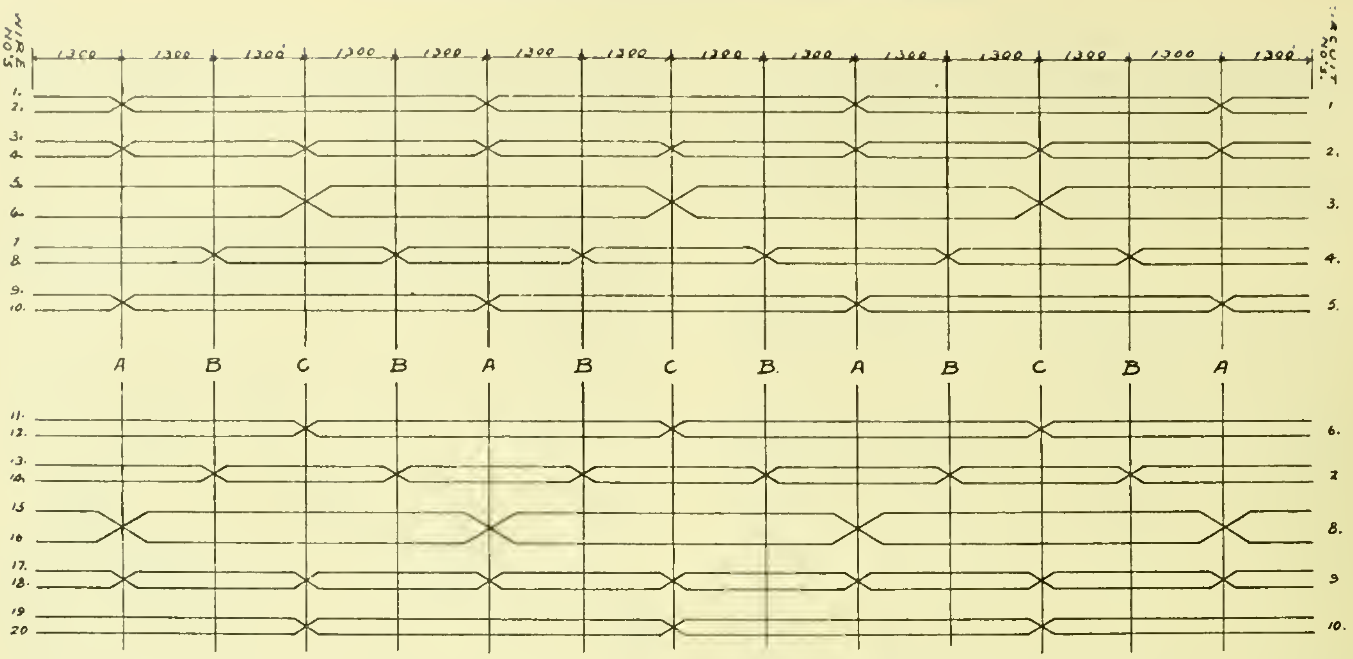


Fig. 5 2 pin steel bracket



DO NOT TRANSPOSE ON CORNERS THE 1ST - 3RD - 5TH - 7TH ETC ARMS ARE TRANSPOSED THE SAME THE 4TH - 6TH & 8TH ARMS ARE TRANSPOSED THE SAME FOR 6 PIN ARMS TRANSPOSE THE SAME OMITTING 1-2, 9-10, 11-12, 19-20 ETC

Fig. 6—Typical Method of Transposing on two Ten-pin Cross-arms

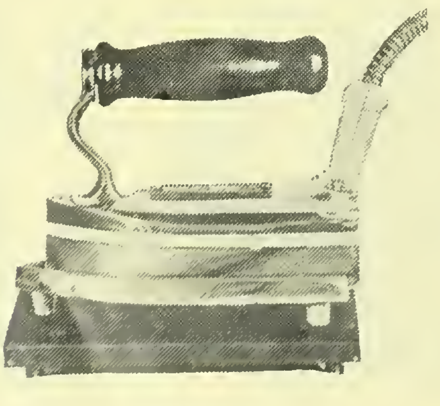
positions may be arranged in the same manner as for ten pins, except that the circuit mounted on the first and second pin or the ninth and tenth pin is omitted. In like manner leads with smaller arms may be transposed.

Transposition poles, as seen by Fig. 6, should be located as follows: measure a distance of about 1,300 feet from the first pole of the line and mark the pole nearest to the point so measured A. Measure successive distances of 1,300 feet each and mark these poles B, C., B. A. B. C., B. A. B. C., etc. No transpositions take place at poles between these points. Transpositions (considering upper and lower arms) at the 1st, 3rd, 5th, 7th, etc., poles are the same, i.e., five transpositions are made each time. Also at the even poles the 2nd, 4th, 6th, etc., the transpositions are the same, two circuits being crossed each time. The general plan indicated in Fig. 6 may be followed for a fewer or greater number of lines with quite satisfactory results.

New Industrial Apparatus

The New "Ideal" Electric Iron

The Ideal Electric Manufacturing Company, London, Ont., the pioneer Canadian manufacturers of electric heater goods, have just issued an attractive booklet describing their irons, stoves, radiators, urns, etc.



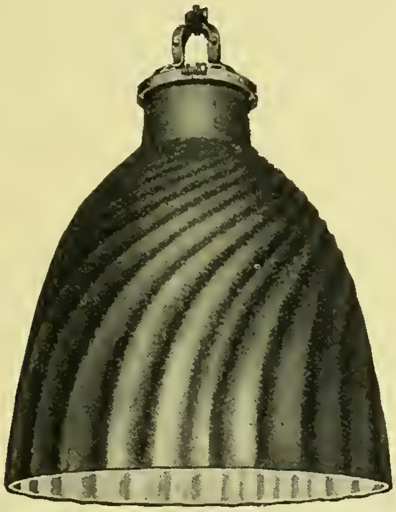
The new "Ideal" iron, which is illustrated herewith, is said by the makers to consume from 1 to 2 amperes less current than many other makes, because the patent heating element lies flat on the base and all the heat generated is utilized at the point of contact with the material to be ironed. The base is solidly embedded in metal on both sides, yet it can be replaced by any person in a few minutes and does not require an expert to repair it. The heating elements are covered by a guarantee for a year, but the life in one of the elements, handled with ordinary care, is claimed to be from 5 to 10 years. The single pedestal handle makes it impossible to burn the hand. The pedestal is of malleable iron, which is very tough, and will not break if let fall. The porcelain detachable plug at the heel of the iron, and the excellent slate base heat resisting stand are other important features connected with the "Ideal" iron. These irons are made of the very best material and are duplex nickel-plated throughout.

The Megger Meets this Need

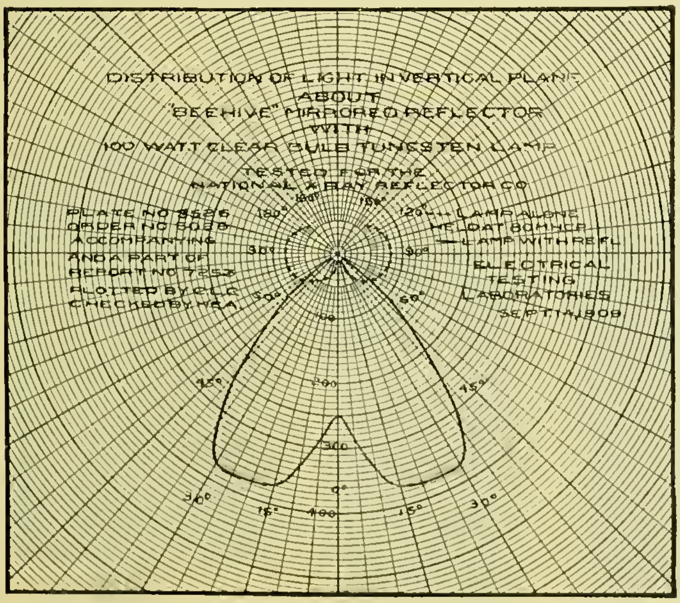
In every piece of electrical apparatus the thing next in importance to proper or suitable conductor resistance is to have sufficient and suitable insulation. This is not only true because of the importance of having current flow only in proper paths through conductors so that the apparatus continues operative, but because through defective insulation resistance more risk of destruction and fire is incurred than from any other cause. One needs only to look into the Standardization Code of the American Institute of Electrical Engineers, the National Electrical Code, the specifications and proposals of every consulting engineer, apparatus manufacturer or purchaser of electrical materials to see how important insulation resistance is counted. Much is said nowadays about the great importance of a high voltage breakdown test to determine insulation resistance. No one will dispute that there are two qualities to insulation; ohmic resistance, and dielectric resistance against rupture. There is no question but that one of these may be large and the other small. But it is also certain that there must be some relation between them so htat the probability of breakdown can be predicted from an insulation resistance measurement. It is unscientific to test completed electrical apparatus by applying the strain due to high voltage up to a point which leaves it almost broken down; strained past the elastic limit as it were. As unscientific as to apply a large breakdown mechanical force to a finished structure if any other plan of determining its safety would answer the purpose. The crudity of the electrical tests for break-down condemns them. The reason they are made much of is because a testing voltage like or exceeding working voltage is easily obtained by alternating current and there has been no instrument available for the measurement of insulation resistance which gave direct readings, up to high values of resistance if need be, and which could be used anywhere by anyone.

The "Beehive" Reflector

The National X-Ray Reflector Company has placed on the market a new reflector for Tungsten lamps, which, on account of its shape, is called the "Beehive."



The distribution of light from this reflector with a 100-watt tungsten lamp operated at 80 mean horizontal candle-power is shown in Fig. 2. The shape of the reflector is shown in Fig. 1.



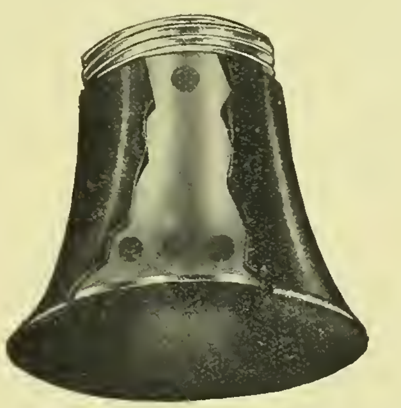
Its total depth is 11⅝ inches. As will be seen from the distribution curve, this reflector with a 100-watt tungsten lamp will give a fairly even illumination over a surface extending 30 degrees from a vertical line through the lamp axis. With a 250-watt tungsten lamp, the area lighted is increased to 45 degrees, but the shading of the lamp by the reflector is, of course, not so complete.

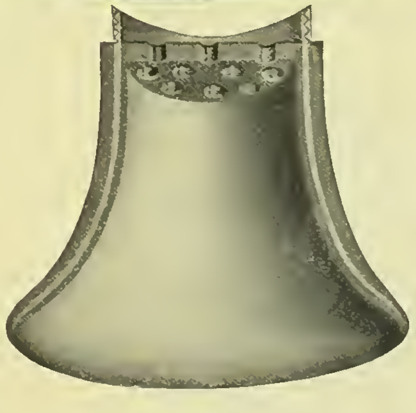
The special field for this type of reflector is in the lighting of factories, gymnasium rooms, foundries and other places where it is desirable to place the lamps high oot of the range of vision and at the same time obtain high efficiency and shade the lamps so that ordinarily no direct rays from the lamp will enter the eye.

An analysis of the distribution curve shown in Fig. 1 brings out the fact that the mean candle-power between the vertical and 60 degrees from the vertical (which is practically the entire range of the reflector) is 131.1 cp., giving 610 lumens. With a lamp consuming 100 watts, this would give lumens per watt equal to 6.1 and watts per lumen 0.164. In other words, with lamp and reflector clean, as under test conditions, an average illumination within the range of the reflector of 1 foot-candle could be obtained with an expenditure of 0.164 watt per square foot without regard to the color of ceilings or walls. For locations where ceilings and walls are dark and have little reflecting power, this type of reflector is, therefore, well adapted and gives high efficiency.

Two Illustrations of New Kellogg Mouthpiece

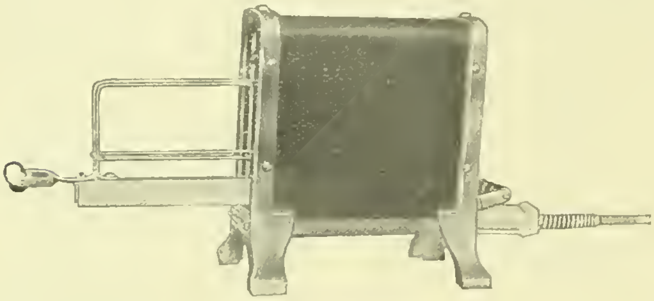
Two views of the New Kellogg transmitter mouthpiece are shown herewith, which bring out the new features of the part. The new Kellogg mouthpiece has a strong steel base. This pressed steel form is perforated with two rows of holes and placed in a mould filled with rubber composition. This mould forces the rubber into shape on the steel form under great pressure, which forces the rubber insulation into the holes in the metal. This process insures the rubber from chipping or cracking on the metal. Figure 1 illustrates a part of the rubber insulation removed to show the two rows of perforations in the metal. Figure 2 is a cross section view of mouthpiece, showing outline of steel form and the inner and outer shells of rubber. This mouthpiece does away entirely with the constant breakage expense of the old style, yet is a perfect insulator, avoiding any damage from shock due to crossed wires.





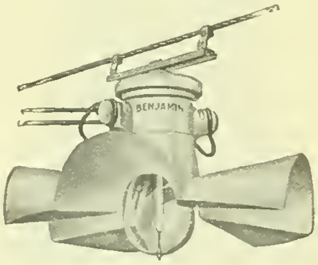
National Electric Heating Company

Every wheel is now turning to its fullest capacity in the large factory of the National Electric Heating Company at Galt. This young but progressive company is evidently setting out to get a large volume of business in the line of electrically heated devices, and plans have been made accordingly. Their factory is equipped with the very latest machinery for turning out the kind of goods likely to get repeat orders.

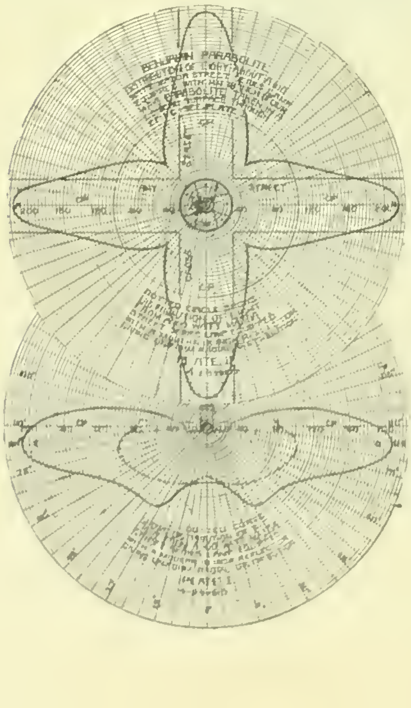


Their new catalogue has just been issued describing a very complete line of electrically heated goods, including all sizes of irons for domestic, laundry and tailors' use; stoves in three different sizes; single and double size vertical toasters, which toast bread on both sides at the same time; chafing dishes; coffee pots and urn type percolators; electric window rods for taking frost off windows. This line will be added to from time to time.

The Benjamin Parabolite



The Parabolite is a new fixture of the Benjamin Electric Manufacturing Company, of Chicago, for street lighting with Series Mazda lamps. By means of a porcelain enamelled steel reflector composed of four intersecting semi-parabolas surrounding the lamp, the greater portion of light is projected down the centre of the street, and only the necessary minimum amount is allowed to reach the street corners. As a result the light secured for the street proper is increased more than 50 per cent. as compared with the usual amount when allowed to radiate over 360 degrees. Where it is desirable to suspend the fixture in the centre of the block, reflector with two (2) instead of four (4) semi-parabolas is furnished. The body of the device is composed of a porcelain base forming the main part of the socket, and integrally formed knobs. This base is supported by an iron fitting attached by four screws. The fitting in turn is covered by a porcelain petticoat insulator, which is held in position by a metal bushing screwed into the supporting casting. The porcelain knobs are located as nearly as possible in line with the bottom of the metal supporting flange. The strain of the wires has therefore little or no leverage, and the danger of breaking the insulator is thus lessened. The binding plates are well protected, and are steadily accessible. The socket is provided with a spring centre contact, serving as short circuiting device when the lamp is removed or accidentally loosened. It thus prevents the film from being punctured except when the lamp filament is broken. A heavy porcelain ring carrying the threaded socket shell and filament cut-out is connected with the main socket by means of a bayonet snap lock, and can only be removed by pulling the porcelain downward and turning it to the left. The strain of placing or removing the lamp cannot unlock connections.

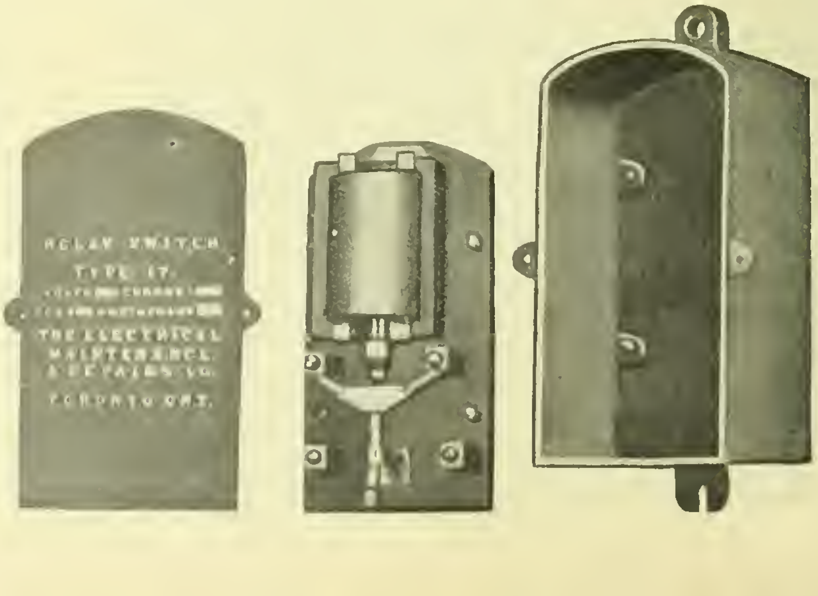


The Nernst Lamp Company, Canadian Department, Toronto, have installed two hundred glower units in the large new store of Holt, Renfrew Company, Limited, Adelaide and Yonge streets, Toronto. This installation consists of some specially designed Westinghouse Nernst lamps, which embody a new feature by using a violet inner globe. Westinghouse Nernst lamps are used exclusively throughout the entire building. The illumination is exceptionally bright without the detrimental feature of high intrinsic brilliancy.

The delegates to the convention of the National Electrical Contractors' Association, which is being held in Atlantic City towards the end of July have been invited by the secretary to contribute an address at this meeting dealing with electrical contracting, conditions in Canada. At the monthly meeting held June 9th Mr. H. J. Vickerson was elected to the executive committee in succession to Mr. C. G. Matthews, who has removed to New York.

Solenoid Switch

The Electrical Maintenance & Repairs Company, 162 Adelaide street west, Toronto, have now perfected their Solenoid Switches for both 25 and 60 cycles. These Solenoid or remote control switches were originally designed for use in Merritton, Ont., to meet the views of Mr. C. H. Mitchell, consulting electrical engineer, for a simple, reliable switch. They save wiring and line loss, and are very compact. They have only one moving part, and will operate with certainty with a drop of 15 per cent. in line voltage.



Current News and Notes

Bowmanville, Ont.

The by-law for municipal ownership of the Bowmanville Electric Light Company was carried.

Barrie, Ont.

The Monarch Railway proposition, as submitted to the Town Council, did not meet the latter's approval, and the railway was asked for another conference.

The Canadian Producer and Gas Engine Co., Limited, expect to make additions to their already large plant here. Quite a number of proposals are under way from which they expect considerable business in the next few months. Among the plants for immediate delivery is a 150 h.p. 3 cylinder producer gas plant for Alexander Dobson, Beaverton; a 65 h.p. 3 cylinder engine, nat- Dunnville, and a 140 h.p. gas engine for power purposes at the mills of the Monarch ural gas fuel, for electric light purposes, at Knitting Co., Dunnville.

Berlin, Ont.

N. Gross, electrical contractor, of Berlin, Ont., has recently added a new department, that of electric signs, to his business. Several large signs have been installed by Mr. Gross in different towns lately, which are said to have given great satisfaction.

Brantford, Ont.

The Crown Electrical Manufacturing Company has been incorporated here; capital $200,000; incorporators, W. D. Schultz, and John S. Dowling.

Grand Valley Railway Company (Wm. P. Kellett, chief engineer) is stated to have awarded contracts to the Warren Bituminous Paving Company and to P. H. Secord & Sons, Limited, for the construction of 11 miles of single track in Brantford. It is intended to use 80-lb T-rails and white oak ties laid in 12 inches of concrete.

Brockville, Ont.

The contract for the generators required in the overhauling of the Brockville Municipal plant has been awarded to Kilmer, Pullen & Burnham, Toronto, Canadian agents for the General Electric Co., of Sweden. The generators are to be direct connected to Belliss & Morcom high speed vertical engines, supplied through Laurie and Lambe, Montreal.

Coaticook, Que.

The Town Council, according to the requests of the ratepayers, has decided on a tariff of flat rate for electric lighting.

Calgary, Alta.

Plans are being prepared for a power plant here. Estimated expenditure, $80,000.

Tenders will be received until July 12th for one 750 B.H.P. engine, 300 r.p.m., with condensor; also one 600 k.w.d.c. 600 volt generator switchboard, etc. H. E. Gillis, city clerk.

Tenders are being invited for a telephone conduit system to cost about $40,000. Smith, Kerry & Chace, engineers, Bank of B. N. A. Building.

Coquitlam, B.C.

An order-in-council has been passed confirming the long-pending agreement between the Minister of the Interior and the Vancouver Power Company for the construction of a dam and plant at Coquitlam for power purposes.

Dauphin, Man.

The $11,000 bylaw for electric light purposes was carried.

Edmonton, Alta.

The Edmonton Heat & Light Co. has offered to supply the city of Edmonton with 6,000 h.p. at the rate of $35. It is understood the power would be developed at Rocky Rapids, on the Saskatchewan River, some 60 miles from here, where about 35,000 h.p. is available.

Estevan, Sask.

The Town Council of Estevan has authorized the Water and Light Committee to proceed with the erection of a municipal electric light and power plant. The committee consists of Dr. D. R. Davies, and Messrs. W. J. Hobbs and A. N. Scott. A suitable site has already been purchased.

Farnham, Que.

The ratepayers have approved of a bylaw to raise $100,000, for the erection of a dam and for general power development work.

Fort William, Ont.

The Fort William Coal Docks Co., have commenced work on their new 500,000 ton plant. They are installing an initial 200 kw. motor generator, with flywheel and "slip" regulator, for taking up heavy momentary fluctuations. They are taking delivery at 25,000 volts from the Kaministiquia Power Co. The Canadian Westinghouse are supplying all electrical equipment. Contract calls for completion by August 1st.

Contracts for various supplies in connection with street railway material, were awarded as follows: Cull ties, J. C. Hunter, 21 cents each; cedar poles, J. C. Hunter, 15½ cents per foot; spikes, Fife Hardware Company, $2.47 per 100 lbs.; bolts, Northern Engineering & Supply Company, $3.60 per 100 lbs., f.o.b. West Fort; washers, R. S. Piper Company, $13.00 per 100 lbs., f.o.b. West Fort; gravel, Mount McKay & Kakabeka Railway Company, 65 cents per yard; weatherproof feeder wire, Canada General, $16.70 per 100 lbs.; copper trolley wire, Phillips Electric Company, $15.49 per 100 lbs.; steel rail bonds, United States Export Company, 29 cents, 37 cents and 63 cents each; rail joints, rail joint company, $1.53 each; steel rails, Algoma Steel Company, $32.50 per ton; strain insulators, Northern Electric, $27.50 per 100 lbs; 5-16 span wire, Northern Electric Company, $4.50 per 10 0lbs.; 3-8 span wire, Northern Electric Company, $4.30 per 100 lbs.; fork bolts, Northern Electric Company, $26.87 per 100 lbs.; cone hangers, Canada General, 54 cents each; single pullovers, Canada General, 67 cents each; double pullovers, Canada General, $1.10 each; clinch fars, Dawson & Company, $32.50 per 100 lbs. The engineer was authorized to order brass goods from next tenderer if present company cannot fill order as specified. G. A. Knowlton, chairman, Works Committee.

Guelph, Ont.

W. W. Duncan, a Guelph contractor, has offered to build an electric road from Guelph to Puslinch Lake, a distance of eight miles, with the assistance of the city to the extent of $25,000, for the use of which amount of money he offers to give the city a second mortgage on the road, and agrees not to bond the road for more than $15,000 per mile.

The City of Guelph have awarded to the British Aluminium Company, Limited, (Canadian agents, Parke & Leith) the contract for about 5 miles of No. 3/0 B. & S. gauge and 300,000 C. M., double braided weatherproof insulated aluminum cable to be installed between the sub-station of the Hydro-Electric Power Commission and the local sub-station here.

Hornby, Ont.

The Halton Telephone Company, with $10,000 capital has been incorporated here by Hiram E. Tuck and George A. Kennedy.

Harvey Station, N.B.

The York Mills and Harvey Station Mutual Telephone Association was organized with the following officers: Robert Little, president; Walter Piercy, jr., secretary-treasurer; Frank Coburn, Amos Little, and Alex. Little, directors; Joseph Robison, auditor. There are about eighty members in the association who are bound by a partner ship agreement. The telephone line, which is almost completed, runs between York Mills and Harvey Station all on private property. It is proposed to connect with the Brockway and Prince William telephone lines.

The Bell Telephone Co. has concluded negotiations with the Southwold & Dunwich Telephone Association, for connection at St. Thomas and Dutton on both the flat rate and toll basis. This system extends from the village of Iona to points in the township of Caradoc, county of Middlesex, and townships of Dunwich and Southwold, in all about 200 subscribers.

Ingersoll, Ont.

Two bylaws, one to raise $39,800 to acquire the plant of the Ingersoll Power & Light Company, and the other to raise $15,000 to make improvements and extensions to the plant, were carried.

A committee consisting of Mayor Mackay, Reeve Fleet, and Alderman Mills was appointed with full power to take the necessary steps to take over and operate the electric light plant and works, and to make any necessary changes in same that may be required, give orders and purchase any material that may be required, hire and discharge any help that may be required, said committee to report to the council from time to time.

Kincardine, Ont.

The Township Council of Kincardine has granted the privilege of erecting poles with telephone wires placed upon them from the boundary of the Townships of Kincardine and Bruce southwards along the B. Line of the Township of Kincardine to the Town of Kincardine, this system being a mutual system of telephone erected by a mutuat company.

Lloydminster, Sask.

After a deadlock lasting for over two years, the Town Council has reached a solution of the dispute regarding the civic lighting plant, and on Friday the current was again turned on througnout the town.

Longueuil, Que.

The corporation of Longueuil have been authorized to raise $35,000 for municipal improvements, including the installation of an electric lighting plant and installation of an electric water pumping system, at a cost of $24,000. A steam road roller, stone crusher and motor will be purchased at an approximate cost of $6,000. City sheds will be erected to cost $800, while $3,600 will be invested for quarry supplies.

London, Ont.

Contract for a steel tower to be used in connection with electrical distribution was awarded to the Ontario Wind Engine and Pump Company, Toronto, for $585 f.o.b. London, and $175 for erection.

The street railway current is said to be causing damage to the city water mains by electrolysis.

Engineer Roberts has laid out a scheme for lighting Victoria Park by means of underground cables. There would be fifty Tungsten lights used, and the park would be well lighted.

One of the first duties to be performed by Frank R. Dark, the newly-appointed power solicitor and electrical expert for the city, will be to report on the damage done by electrolysis in the city.

Minnedosa, Man.

Snyder Bros., of Winnipeg, secured the contract to build a dam on the Little Saskatchewan on a bid of $41,528.

Medicine Hat, Alta.

Preliminary reports are in on the electric light plant. Probable cost, $[illegible],000. The city is considering moving the waterworks farther up the river in conjunction with the electric light plant.

Moncton, N.B.

The agreement prepared by the city council with the Street Railway Electric & Gas Company for the leasing of the city lighting plant for thirty-nine years has been endorsed by the ratepayers.

Moose Jaw, Sask.

A bylaw will be submitted to the ratepayers on June 17th to raise $100,000, of which $35,000 will be used in extension of electric light system.

Moncton, N.B.

The I. C. R. management has notified the City Council that in future it will supply its own electric lighting for crossings in the city. The I. C. R. has been a large customer of the city light department, but will now supply all the electric lights from the railway plant.

Meaford, Ont.

Chas. Barber and Sons, manufacturers of the Canadian Turbine Water Wheel, have completed the main turbine installation for the Miner Rubber Company, Limited, in their new and modern plant at Granby, Quebec. The results obtained have been so satisfactory that the company has ordered two 70-inch Canadian turbines, gearing and connections, to be installed at their reserve dam. The Canadian is the only Canadian designed turbine water wheel on the market, and has proved itself efficient and economical in the use of water. A catalogue descriptive of this company's turbines will be sent to any address on request, and should be in the hands of all interested in the practical conservation of our water powers.

Montreal, Que.

Five thousand dollars damages was awarded by a Superior Court jury to Joseph T. Girard for the loss of his two year-old child. The case was heard before Mr. Justice Archibald and a mixed jury, and lasted two days. In his evidence, the motorman contended that he had only seen the child when at a distance of fifteen feet. He had immediately applied the brakes. The jury found, however, that he might have seen the child earlier, and brought the car up in time, had he been keeping a better lookout.

The inauguration of the Montreal & Southern Counties Railway Company's line to Longueuil took place on Saturday, May 28.

. . the annual meeting of the Montreal Light, Heat & Power Company a by-law was adopted to provide a pension for aged employes, along similar lines to the pension schemes of large railway corporations. A sum not exceeding $10,000 will be laid aside for this purpose each year.

The Swedish General Electric Company, through their Montreal sales manager, Mr. H. D. Bayne, has been awarded the contract for electrical equipment required for the Jacobs Building sub-station of the Dominion Light, Heat & Power Company. One 150 h.p. motor generator set and one 350 k.w. engine type generator will be installed. The latter to be directly connected to a Belliss & Morcom vertical engine supplied through Messrs. Laurie & Lamb.

The Canadian Westinghouse Company, Limited, has secured through the Montreal sales office, contract from the Quebec Railway, Light, Heat & Power Company for this season's transformer requirements. Also for 25,000 volt lightning arresters, disconnecting switches and choke coils.

G. W. T. Nicholson, general contractor, has received a contract from the Canadian Light & Power Company for the erection of superstructure of power house at Valleyfield.

James Ballantyne, general contractor for the plumbing and heating of the Saskatchewan University Buildings designed by Messrs. Brown & Vallance, has awarded sub-contracts as follows, in connection with the 600 h.p. lighting and heating plant which will be installed: Ross & Greig, representing Sheldon's, Limited, heaters and nine ventilating fans; Canadian Westinghouse Company, switchboard apparatus, one 30 k.w. generator, one 125 k.w. generator; Laurie & Lamb, one Belliss & Morcam 125 k.w. engine, Robb Engineering Company; three 250 n.p. boilers, one 225 h.p. boiler, one 30 k.w. high speed engine.

The Canadian Light & Power Company have awarded the contract for their complete transmission line requirements of high tension and other insulators to the Locke Insulator Manufacturing Company, of Victor, N.Y., through their Montreal representatives, the Engineering Equipment & Supply Company.

The contract for galvanized transmission towers, on the main line from Valleyfield to Montreal has been awarded to the Canadian Bridge Company of Walkerville. The special painted towers which will be employed at crossings, are to be constructed by the Dominion Bridge Company, of Lachine. Mr. Geo. T. Nicholson has been awarded the contracts for the erection of all superstructures for the power houes.

New Michel, B.C.

Broley & Martin, the contractors in charge of the new waterworks system for this municipality, are making a deal with the New Michel Sawmill Company to put in an up-to-date electric lighting system.

New Hamburg, Ont.

The by-law for the purpose of taking over the local electric plant owned by J. Morley for $8,000 was carried, and also that to grant the People's Electric Railway a franchise for 25 years.

New Michel, B.C.

The new Michel Water, Light, and Power Co. contemplates installing an up-to-date electric light system.

Ottawa, Ont.

President Jenkins of the Metropolitan Power Company came to Ottawa from Petrolia last week, and had survey work started on the company's property at the Deschenes rapids, at Britannia village, six miles from this city. The president states that it is the intention to make an early start in the work of constructing a plant for the development of power.

An important judgment affecting water powers in the Province of Quebec, was given recently by Mr. Justice Champagne in the Superior Court at Hull. By the judgment, property owners along the Gatineau river are the rightful and legal proprietors of the bed of the river. The importance of it is due to the fact that there are very valuable waterpowers on the Gatineau, and the judgment affects not only the rights of property owners on that river, but also of every river of a similar character in the province of Quebec.

This city is discussing the establishment of a combined power plant and garbage incinerator, similar to that recently installed in Westmount.

Peterborough, Ont.

J. H. Larmonth, managing director of the Peterborough Light & Power Company, is the authority for the statement that his company has purchased the dam at Auburn, above which a new dam and power house will be constructed to cost about $125,000.

Canadian Agents Wanted

Leading firm of British telephone manufacturers are open to appoint sole purchasing agent for Montreal and Toronto. Only first-class, well established firms capable of buying large quantities of telephone apparatus, electric bells, etc., need apply. "Telephone" care of GORDEN & GOTCH, St Bride Street, London Eng. 8

Wanted—Men of Experience

in the operation of hydro-electric plants, transmission lines and sub-stations. Positions will be open November 1 st. Plant located near Calgary, Alberta. Give full details of experience and references. CALGARY POWER COMPANY, 179 St. James Street, Montreal. 7

Engineer Wants Position

An Electrical Engineer with ten years' experience in power and lighting plants. Six years experience on the mains and consumers departments and four years as operator and charge engineer, desires a position, can commence immediately, good references. Address box 108 ELECTRICAL NEWS, Toronto, Ont. 7

Electric Light Foremen

for line gangs, wanted by Company in Eastern Canada Must be able to speak English and French, and capable of handling general city line work under supervision of a general line foreman, including construction, maintenance and reconstuction of A. C and D. C. street arc lighting circuits—2200 volt A. C. 3-phase and 2-phase distributing circuits—transformer work for lighting and power. Stating age, married or single, experience, wages expected and reverences. Apply to Box 995 ELECTICAL NEWS, Toronto, Ont. 7

General Line Foreman

wanted by large Electric Light Company in Eastern Canada. Must be a man with good experience and capable of handling all kinds of general line work in large city, including new construction, maintenance and reconstruction of series A. C. and D. C street arc circuits, 2-Phase and 3-Phase 2200 volt distributing circuits, transformer work for lighting and also for 2-phase and 3-phase power, high tension transmission lines up to 50,000 volts.

Must be able to speak English and French, and capable of handling about 15 line gangs, stating age, married or single, experience and salary expected, together with references. Apply to Box 996 ELECTRICAL NEWS, Toronto, Ont., 7

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Siemens Bros. Dynamo Works, Ltd. -	London and Stafford
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Port Arthur, Ont.

The bylaw for $30,000 for extension and equipment of municipal telephone service and also for $10,000 for extension of the electric lighting system were carried.

Quebec, Que.

We have been informed that A. C. Argall Company, of Montreal, have been awarded the contract for the reinforced concrete dam at the power station of the Deschambault Electric Company, St. Alban, at $31,300. J. F. Guay, consulting engineer.

Renfrew, Ont.

The bylaw to raise by debenture the sum of $82,000 for water power development was carried.

St. Thomas, Ont.

The Bell Telephone Company recently changed the old magneto system over to central energy without one moment's interruption to business. With its fine new buildings and up-to-date system St. Thomas telephone facilities are now probably unexcelled on the continent.

Stratford, Ont.

District Superintendent Smith of the Bell Telephone Company has stated that a duplicate of the St. Thomas new building will be erected this season in Stratford, and that tenders are already being received.

Saskatoon, Sask.

Shepherd & Taylor, of Edmonton, are considering the building of a street railway system in Saskatoon.

St. Catharines, Ont.

A by-law has been prepared proposing to give a power franchise to the Ontario Power Company. The company, it is understood, has no intention at present of supplying light to the city, but asks for permission to erect poles and string wires for power purposes only.

Toronto, Ont.

The Robb Engineering Co. of Amherst, N.S., are installing a cross compound 750 h.p. engine for the knitting mills of Joseph Simpson and Sons.

Work will shortly be commenced upon the extension of the Dominion Government telegraph and telephone system through the islands in the north of the Gulf of Georgia. The projected extensions embrace 59 miles of land wire and 82,050 feet of cable. An early start will be made upon the land lines, and the cable connections will commence when they are completed.

Victoria, B.C.

The contract for supplying ornamental pillars and fittings, for the new street lights on Douglas street has been awarded to Hutchison Bros., at a cost of $54 each.

The contract for the work of laying the conduits on Douglas street for the underground system of telephone wires will be let to the Electrical Construction Company, of Vancouver, for $3,900.

The city will shortly call for tenders for fifty additional arc lights. Cost, about $3,500.

Winnipeg, Man.

At a special meeting of the city council it was decided to purchase seventy-one feet of property on the west side of King street, some 200 feet distant from Notre Dame, for the erection of sub-distributing power station No. 1.

The Board of Control recommended letting of the contract for the cooling tower in connection with the power plant terminals to Ferdinand Bauer, of St. Louis, at a cost of $3,380. W. G. Chace, engineer in charge.

The contract for power and electric lighting wiring of the new workshop which the Dominion Bridge Company of Lachine are erecting here, has been awarded to W. J. O'Leary & Company. Approximately 1,000 h.p. in motors will be installed and the wiring will be in conduit.

M. Peterson, secretary, Board of Control, confirms the items published in last issue concerning the award of conduit, erection of sub-station, etc., and also states that G. M. Gest, Montreal and New York, has been awarded the contract for construction of conduit runs at the unit prices stated in said tender.

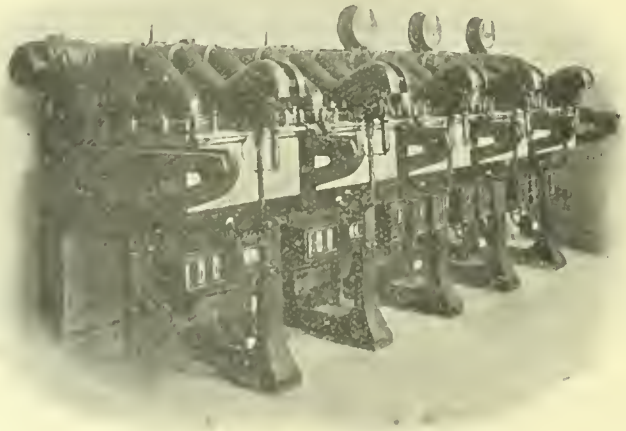
The Board of Control have recommended the following for acceptance (in each case the lowest): Northern Electric & Manufacturing Company whose quotation, based on 280,000 duct feet was 7.82 cents a foot or $21,896, was given the contract for conduits. This allows for the completion of all runs, plans for 1910, and provides a general amount of surplus stock for short extensions.

The contract for the McPhillips street sub-station—known as No. 2—goes to the engineer of construction, J. W. Astley, at $11,423.19. The equipment of substation No. 2 is to be placed in the hands of the Canadian Westinghouse Company at a cost of $29,616. This includes a bank of three transformers of 1,500 k.w. gross capacity as well as the necessary auxiliaries for installation in the terminal station building. In respect to the contract for construction of conduit runs, the recommendation will provide that G. M. Gest be awarded the contract, which is not to exceed $40,000.

Manitoba's experience with Government telephone ownership has cost to date $7,609,659 in capital outlay, and the system is said to be depreciating in value on account of insufficient maintenance reserve.

Complete Sub-Station **SWITCH-GEAR** For from 600 to 20,000 Volts

NO FIRE OR LIFE RISKS NO DISCONTINUITY OF SUPPLY



The apparatus includes a perfect system of protection for the instantaneous isolation of any faulty section of an electrical power transmission and distribution system **without interference** with any other sections.

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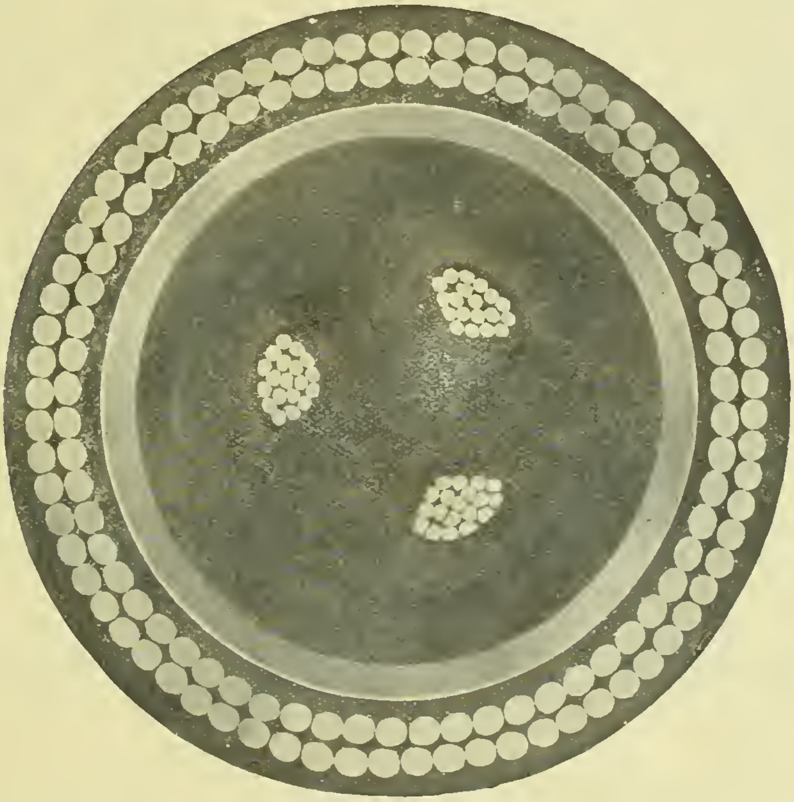
Power Cables



No. 1/0 B.&S. Gauge, Three Conductor, Paper-insulated, Lead-covered, Double-wire Armoured, Submarine Cable, built to the specification of R. S. Kelsch, Esq., Consulting Engineer, Montreal.

Working Pressure 25,000 Volts

Diameter over lead 3.25 in.
Diameter over all 4.16 in.
Weight per foot 22 lbs.

SOLE CANADIAN REPRESENTATIVES

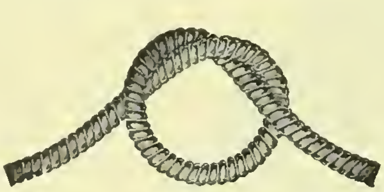
Canadian British Insulated Company Limited

Montreal

"Sterling" Conduits

Conduits Company, Limited, Toronto, extensive Canadian manufacturers of conduits for interior construction, have just issued an illustrated booklet describing their various lines of conduits. The booklet contains much valuable information for those who buy, use or specify either solid or flexible conduit.

In addition to the well-known "Galvaduct" and "Loricated" types of conduit, the company now handles "Sterling Flexible Steel Conduit" and "Sterling Flexible Steel Armored Conductors." "Sterling" conduit is very flexible and can be tied into a knot without affecting the smoothness of the interior or the uniform roundness of the tubing. The locking of the convolutions prevents an opening in the raceway at bends, so that under every condition this flexible tubing serves as an efficient envelope to the wires which it is designed to carry. "Sterling" Flexible Steel Armored Conductors are recommended chiefly on account of the degree of protection afforded in wiring old or completed buildings. High grade, tested, insulated wire is perfectly armored with galvanized steel strip in the form used in the manufacture of "Sterling" Flexible Steel Conduit. Ease of installation, and low first cost over rigid conduit with conductors separately drawn in, will be readily recognized by those familiar with electric wiring.



MOONLIGHT SCHEDULE FOR JULY

(Courtesy of the National Carbon Company, Cleveland, Ohio.

Date.	Light.	Date.	Extinguish.	No. of Hours
July 1	8 00	July 2	2 30	6 30
2	8 00	3	3 00	7 00
3	8 00	4	3 10	7 40
4	8 00	5	3 50	7 50
5	8 00	6	3 50	7 50
6	8 00	7	3 50	7 50
7	8 00	8	3 50	7 50
8	8 00	9	3 50	7 50
9	8 00	10	3 50	7 50
10	8 00	11	4 00	8 00
11	8 00	12	4 00	8 00
12	8 00	13	4 00	8 00
13	10 00	14	4 00	6 00
14	10 30	15	4 00	5 30
15	10 50	16	4 00	5 10
16	11 20	17	4 00	4 40
17	11 50	18	4 00	4 10
19	0 30	19	4 00	3 30
20	1 10	20	4 00	2 50
21	2 00	21	4 00	2 00
22	No Light	22	No Light	
23	7 50	23	10 20	2 30
24	7 50	24	10 50	3 00
25	7 50	25	11 20	3 30
26	7 50	26	11 40	3 50
27	7 50	28	0 10	4 20
28	7 50	29	0 30	4 40
29	7 50	30	1 00	5 10
30	7 40	31	1 40	6 00
31	7 40	Aug. 1	2 20	6 40
		Total	....	165 40

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Generation, Transmission and Application of Electricity

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EDITOR'S ANNOUNCEMENT.

Correspondence is invited upon all topics coming legitimately within the scope of this journal. Subscribers can materially assist by sending in news items and information regarding electrical development in all parts of Canada.

Vol. 19 Toronto, August, 1910 No. 8

British Manufacturers in Canada

It is with a distinct feeling of pleasure that we note the efforts of our esteemed contemporary the "Electrical Review," in a recent issue, to arouse British manufacturers to a sense of their long-neglected opportunities in the Canadian electrical field. For years we have been looking for a reason to account for the indifference with which we have been treated commercially. This indifference is the more unaccountable when one sees what confidence the English financier places in the future of Canada. Whenever our bonds are placed in the market they are generally over subscribed two or three times, yet, notwithstanding, England is giving us the money to develop our country, the great majority of English manufacturers do not think our requirements are even worth investigating, and, consequently, the United States are profiting thereby. Certainly such visits as that made by the British Association in 1909 have very beneficial results. The natural trend of business should be to build up the Empire of which we are so justly proud, and those manufacturers who have been far-sighted enough to study the conditions here, have been rewarded with most encouraging results. Unfortunately there are a number of concerns who have tried to get our business without making themselves conversant with our requirements, consequently they have met with failure and have come to the conclusion that they could not act successfully in this field. To the lack of familiarity with our conditions the non-success of their adventures can almost invariably be traced.

In the first place a first-class representative should be sent out to study our requirements, and he should not be hampered with any restrictions as regards expenses, for travelling in Canada is two or three times as expensive as in the British Isles. Another important point is that he should come with full powers of attorney and prepared to take the initiative in the interests of his firm as the occasion warrants. It frequently happens that representatives are sent out with little or no authority to transact business and any orders they might take are made subject to approval from their head office. This old-fashioned method of doing business is unsatisfactory to us, as we have not the time to waste in such matters. When we have any orders to place, we often need to settle the matter right off and cannot run the risk of our business being turned down by a head office, which means having to take the matter up again with the previous firms who submitted prices.

The brightest man the company can muster should be sent out, one thoroughly up to his business and a good up-to-date salesman. It is not uncommon for a board of directors when considering Canada to select one of themselves to make the trip, usually a man who has been out of the selling end of the business for years, and one who is past the days of hustling for orders. This generally ends in the visit being turned into a holiday trip, and the prospects are negatively reported on when he returns. This is a big country, 3.000 miles wide, and a man cannot hope to get a fair idea of the scope here unless he stays for at least three months and works every day of the time.

Again, one of the greatest faults exhibited by our across-the-seas manufacturers, is their attempt to market their own wares rather than learn our wants and cater for them. Also, the head office frequently issues their catalogue with prices quoted in pounds, shillings and pence. This is sent to Canada under the impression perhaps, that because it suits Australia and South Africa, it should suit us. We are accustomed to do business in dollars and cents, and such a catalogue seldom receives proper attention from our buyers, but rather leaves a distinct impression it is not the Canadian business which is especially sought.

To successfully compete, English houses must be prepared to manufacture our requirements, and this should be no hardship since their industrial establishments are perhaps better equipped than those of any other country. When quoting, the price should be so much per foot or pound, as the case may be, and not so much a mile or ton. If the Englishman quotes on a cable having an area of so much of a square inch and weighing so many cwts. per mile, and costing so much a yard, he runs a chance of being turned down notwithstanding the fact that if properly worked out the price may be lowest.

Lack of knowledge of our customs tariff arrangements is also responsible to a large extent for English concerns feeling that they are unable to transact business with Canada. One misjudged conception is that duty must be paid on the gross cost of delivery of the article at its destination. This is an entirely erroneous conclusion, as duty is only payable on the price of the material at the factory. When quoting, prices should be made up on the following basis, for example,—value of goods at factory, value of packing at factory, carriage from factory to shipping point, freight to destination, insurance, dues, cost of bill of lading, date of delivery, etc.

As regards the import tariff a complete list can be obtained by applying to the Collector of Customs, Ottawa. English firms are very fond of quoting all prices f.o.b. Montreal or Quebec, leaving it to the customer to add the freight from these ports to the destination, and the latter is obliged to figure out for himself, if indeed he is sufficiently interested, and knows the shipping weight, the cost of laying down the package at the point required. A little study of the question of rates will show that between Liverpool and Montreal, and between Liverpool and Toronto, the rates vary comparatively little, whereas if you take the rate from Liverpool to Montreal, and add to it the rate from Montreal to Toronto, you will find a big difference. The question of rates should receive very careful attention, though rates to all points of Canada can be obtained for the asking.

In conclusion we would emphasize again that the English representative to Canada should be clothed with more authority, allowed ample travelling expenses and, if he should be settled in the Dominion, given a salary sufficient to enable him to live comfortably. It is useless sending out a good man at say £300 per year as you would find as soon as he begins to work up a connection and do good business a Canadian or United States concern would offer him probably two or three times that amount.

Chain of Wireless Stations on Pacific Coast

The Dominion Government has availed itself of one of the greatest inventions of the age and established a series of wireless telegraph stations along the dangerous and desolate coast lying to the north and west of Vancouver Island, with Prince Rupert as the objective point. The first five of these were installed through the efforts of the Hon. Mr. Templeman (then Senator) after the shocking disaster to the steamship Valencia some years ago, when nearly 100 lives were lost owing to the wreck of this vessel on the west coast of Vancouver Island, and in which connection it was shown that the vessel held together for several days and long enough to ensure the rescue of the passengers if aid could have been summoned. Recently three new stations have been added, covering the route so thoroughly as to guarantee the perfect working of the system under all weather conditions. The stations are located as follows, and their positions are further indicated in the accompanying map: Point Grey, English Bay, Vancouver; Pachena Point, west coast Vancouver Island; Victoria city; Point Lazo, east coast Vancouver Island; Estevan Point, west coast Vancouver Island; Triangle Island; Ikeda, on Queen Charlotte Islands; Prince Rupert, on Digby Island.

The primary object in installing the wireless stations was to aid navigation, but it is, of course, intended to use the service for commercial purposes. The advantage will be understood when we mention that the route traversed could not possibly be covered by a land line. In view of the growing importance of Prince Rupert as the Grand Trunk Pacific terminal, and the rapid development taking place in the timber, mineral and fishing operations up the coast, the institution of this service is a great help to British Columbia business men.

The stations are all being equipped with Marconi's latest apparatus, and each station will have a complete duplicate plant, so that unless under the most extraordinary circumstances the machinery will always be in commission. The capacity of each plant is 2 k.w., with a range of about 200 miles. The general equipment of each sation is of the best, a dwelling house and all modern conveniences being supplied.

The Three Latest Stations.

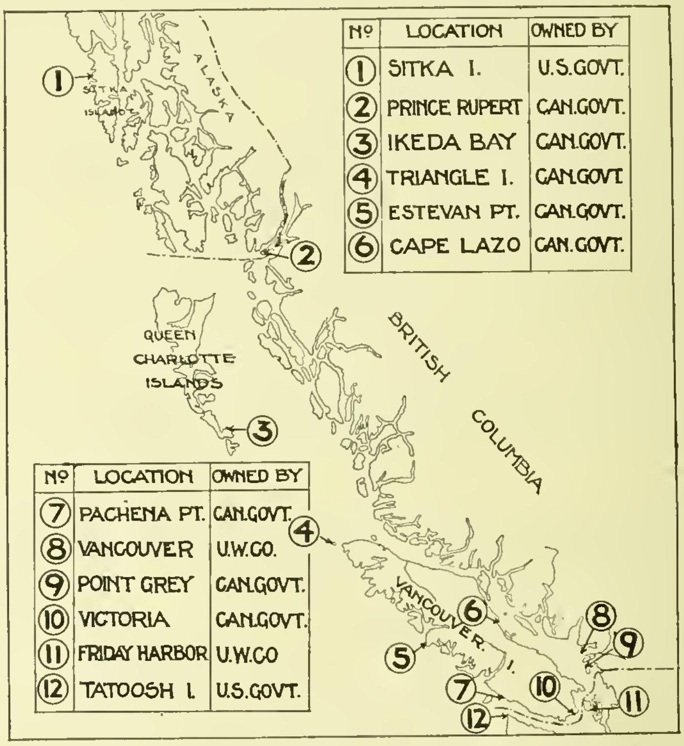
The building of the three latest stations, Triangle Island, on the west coast of Vancouver Island; Ikeda, on Queen Charlotte Islands; and Digby Island, near Prince Rupert, were under the direct supervision of Mr. C. P. Edwards, the Dominion Superintendent of Wireless Stations, an expert in station building and equipping. The latest station to be operated is that on Digby Island, near Prince Rupert. Two masts were erected, and, it is claimed to be one of the finest wireless stations in the world. A tramway 400 feet long, with a forty per cent. grade, had to be built to reach the top of the hill to facilitate the handling of the masts, material, etc. Mr. H. C. Killen, the Marine and Fisheries engineer, surveyed the site and arranged the building of the tramway. Digby Island is very heavily timbered, and the task of clearing four acres at the top and the right of way up the hill, was a difficult matter, in addition to which snow and rain prevailed during nearly the whole period—some six weeks. The island is also connected with the mainland by a cable a mile in length and a two-mile land line over the Grand Trunk Pacific right of way into the city of Prince Rupert.

The masts at each station consist of the three sections, totalling 180 feet in height. Triangle Island tower, 620 feet, with masts of 180 feet, a total height of 800 feet (the highest wireless station in the world with the exception of the Eiffel tower), is situated at the extreme northwesterly end of Vancouver Island, standing out in the Pacific Ocean 40 miles from the nearest land. It is an almost barren rock, destitute of vegetation. This station is proving of great value, being practically the key to the wireless situation in this part of the Pacific.

Ikeda, situated on the Queen Charlotte Islands, three miles from the now famous Japanese Ikeda mine, has already proved of immense benefit to the settlers in and around Ikeda.

Wide Range of Service Now Possible.

The eight stations maintained by the Dominion Government are rendered all the more valuable from the fact that connection may be had with some forty-eight similar stations, operated by the United Wireless Company, which reach from Sitka Island, Alaska, to San Diego, California, and with eight others, operated by the United States government. Four stations not owned by the Canadian government appear on the map shown.



Nº	LOCATION	OWNED BY
①	SITKA I.	U.S.GOVT.
②	PRINCE RUPERT	CAN.GOVT.
③	IKEDA BAY	CAN.GOVT.
④	TRIANGLE I.	CAN.GOVT.
⑤	ESTEVAN PT.	CAN.GOVT.
⑥	CAPE LAZO	CAN.GOVT.

Nº	LOCATION	OWNED BY
⑦	PACHENA PT.	CAN.GOVT.
⑧	VANCOUVER	U.W.CO.
⑨	POINT GREY	CAN.GOVT.
⑩	VICTORIA	CAN.GOVT.
⑪	FRIDAY HARBOR	U.W.CO
⑫	TATOOSH I.	U.S.GOVT.

Showing Locations of Wireless Stations on Pacific Coast.

It may interest our readers to learn that in the early part of a bright day the average working distance for wireless transmission is about 200 miles, although this is frequently exceeded under favoring conditions. After 3 p.m. the Vancouver stations of the United Wireless Company, find no difficulty in communicating with San Francisco, a distance of 900 miles, and after 9 or 10 p.m. the operators in Vancouver and at Los Angeles, California, interchange messages regularly over a distance of 1,300 miles. During the forenoon and early part of the afternoon the Vancouver station of the United Wireless Telegraph Company transmits to Olympia, Wash.

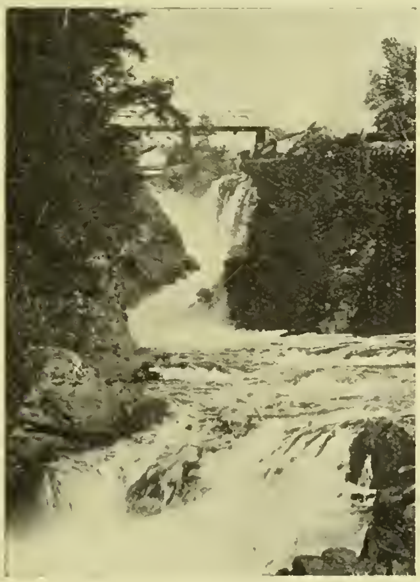
Rates for Wireless Messages.

Arrangements have been entered into by Mr. E. J. Haughton, superintendent of the Canadian stations, with the United

Wireless Company with regard to a scale of charges for customers communicating from steamships equipped with the United Wireless Company's apparatus to stations of the Dominion government's service. The United Wireless Company agree to adhere to the provisions of the Berlin agreement with rgard to wireless communication. The charges arranged are two dollars for ten words, and two cents for each subsequent word on steamships plying from Victoria or Vancouver to northern ports, sixty per cent. of this charge being paid to the land station and forty per cent. to the steamship station, and in cases where it is necessary to transmit the message from the wireless telegraph station by land lines the charges for that service will be added. The United Wireless Company will arrange its own rates for service from the ferry steamers plying between Victoria, Vancouver and Seattle, the Dominion government service stipulating that it receives as its share of the tolls twenty-five cents for the first ten words and two cents per word. Private business is now being handled by the stations in the chain of the Dominion government in British Columbia. The charge for service to Prince Rupert and Ikeda is seventy-five cents for ten words and three cents for each additional word. From Prince Rupert to Queen Charlotte Islands (Ikeda) the charge is fifty cents per ten words and three cents per word. From Ketchikan to Ikeda a rate of fifty cents per ten words has been arranged. The stations will be in operation usually from 8 a.m. to midnight.

Gravenhurst Municipal Development

South Falls or Muskoka Falls, as it is sometimes called, on the south branch of the Muskoka River, is one of the prettiest falls in Canada. This section of Muskoka has for years been the central point of the field of operations of a couple of large lumber companies, who floated their logs down the river to their mills below. To avoid the rapids it was found necessary to construct a dam at the head of the falls and pass the logs down a wooden chute. The upper falls, with the rapids below, as shown in the figure, give a total drop of about 100 feet.

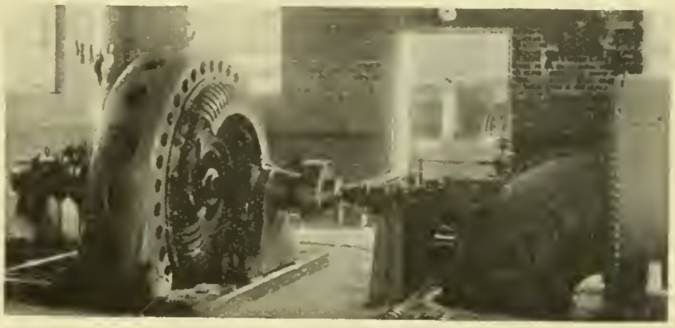


The beautiful Muskoka Falls, eight miles from Gravenhurst

South Falls is situated 8 miles from Gravenhurst, and this progressive town some 3 years ago, conceived the plan of utilizing the possibilities of the nearby water fall, with a dam already constructed, to develop light and power. The present installation, shown in figure 2, is daily justifying this faith in hydro-electric development, and is supplying not only the town of Gravenhurst, but also the farms and homes in the vicinity and along the transmission right of way with all the modern luxuries that electric energy provides.

The power house is of brick and probably large enough to accommodate another unit as the demand for power grows. The present generator installation is a single unit, A.C.B. manufacture, 450 k.w., normal capacity, 600 r.p.m., 3-phase, 60 cycles. Current is generated at 6,600 volts and transmitted without change to Gravenhurst, where it is stepped down, in the sub-station for distribution.

The exciter is belt-driven from the main shaft and is also A.C.B. manufacture, 1,500 r.p.m., 10 k.w. capacity. Generation is at 120 volts, and lead lines direct from the exciter supply current for lighting, at this voltage, to a number of homes in the immediate neighborhood.



Power Generator in Gravenhurst Plant.

The switchboard and all attachments were installed by the A. C. B. Company. The turbines are Jenckes manufacture. The governor is the Woodward type, made in Rockford, Ill.

Electrolytic lightning arresters of the Garton-Daniels type F—2 have recently been installed.

A metal penstock 3 feet in diameter conveys the water from the dam, situated some 1,000 feet above the power house. It would appear that in view of future requirements (the falls can develop about 1,000 horse power) a larger lead pipe should have been installed in the first place. The municipality, we understand, was, however, unwilling to incur the necessary initial expense. The installation of draft tubes would also have materially increased the capacity, to which end the mason work was provided for them and the tubes are actually on the ground but were never installed.

Annual Meeting of Canadian Tungsten Lamp Co.

The annual meeting of the Canadian Tungsten Lamp Company, Limited, was held at the head office, Cannon street, Hamilton, on Wednesday, the 6th inst., all the shareholders with one exception being present. Before the meeting was held, the shareholders were conducted through every department of the factory, and were much impressed with the neat and business-like manner in which each department was run. The president laid the statement before the Board, which showed a most phenomenal growth in this business. Notwithstanding most strenuous opposition, the profits were considered very favorable, owing to up-to-date methods in manufacture, and careful trading. After some discussion, the usual dividend was declared. The increased accommodation provided by the new wing completed the latter end of last November, has proved quite inadequate, and the action of the Board of Directors in securing additional property on Cannon street, east of their old building, was approved of. It was, however, unanimously decided that same should be one storey higher than originally intended, as it was felt that at the present rate of increase, even the new addition would not provide sufficient accommodation. The directors elected were: W. H. Ginder, P. D. Crerar, K.C., F. W. Gates, Alfred Ward and Geo. F. Webb. At a subsequent meeting of the oBard of Directors, Mr. W. H. Ginder was again elected president and managing director.

Ontario Hydro-Electric Distribution Plant

Typical Substations Illustrated and Described — Big Factor of Safety—Loop System Obtains Throughout

By P. W. Sothman

The Ontario Hydro-Electric scheme, by which power is being distributed throughout Southwestern Ontario and as far east as Toronto, was described in popular language in a recent issue of the Electrical News. In the present issue it is proposed to outline, still in only semi-technical language, some typical sub-stations from which this power will radiate to surrounding areas. It has been judged that diagrams representing Niagara, the receiving station; Dundas, the main distributing station; Berlin a typical sub-station of the smaller type, and Toronto, the largest terminal sub-station, would be sufficient to give a very fair and comprehensive idea of the whole plan. Inasmuch as these plans are being well illustrated by the accompanying cuts, it will scarcely be necessary to do more than indicate the different points in each.

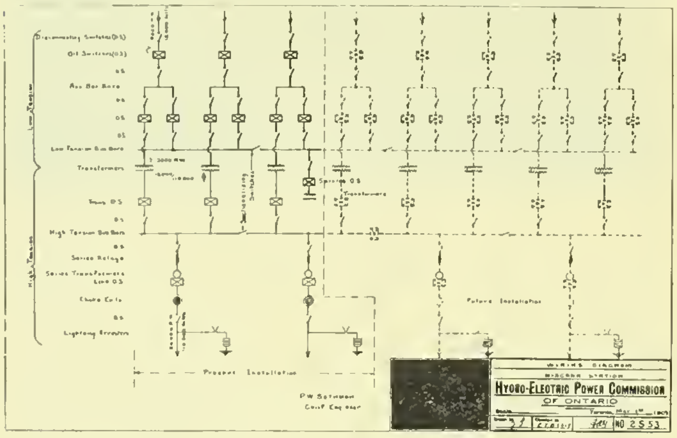


Fig. 1.—Wiring Diagram, Niagara Falls Station.

The power is received at the Commission's step-up transformer station at Niagara Falls by means of underground cables from the Ontario Power Company's station, with which company it will be recalled the Ontario Government has contracted for the delivery of 60,000 h.p. as the demand requires it.

The Niagara Sub-Station.

The power is received at 12,000 volts, 3 phase, 25 cycles. This transformer station is built to accommodate at present four banks of three 3,000 k.v.a. single phase transformers, but the lay-out is such that the building may be extended to accommodate an ultimate capacity of 72,000 kilowatts.

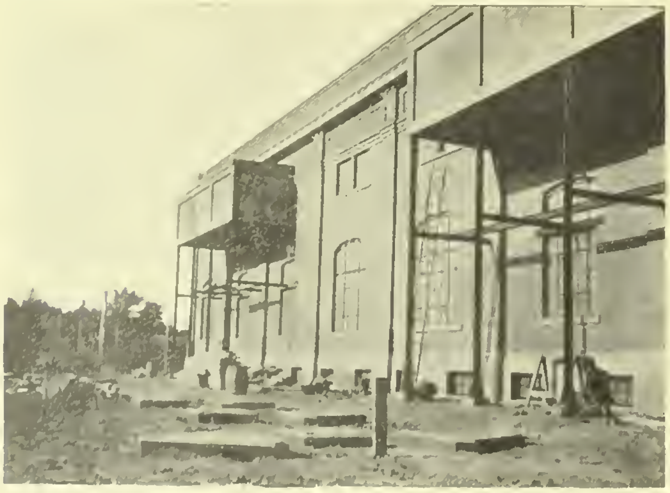


Fig. 2. Showing Protective Hoods on rear of Niagara Station.

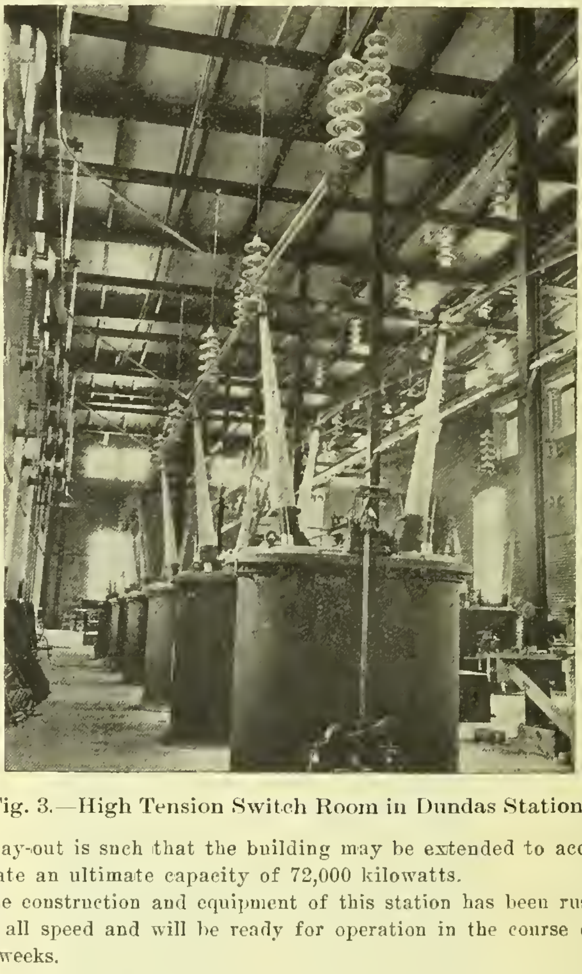


Fig. 3.—High Tension Switch Room in Dundas Station.

The construction and equipment of this station has been rushed with all speed and will be ready for operation in the course of a few weeks.

Within the station the 12,000 volt switching apparatus and bus bars are located in the basement, adjacent to the terminal rooms, where the incoming underground cables terminate. The leads from the transformer oil switches pass up through the floor to the transformers, where the potential is stepped up to 63,000 volts. The transformers are connected in Y on the high tension side, which gives a line voltage of 110,000 volts.

The high tension switch room extends along one side of the

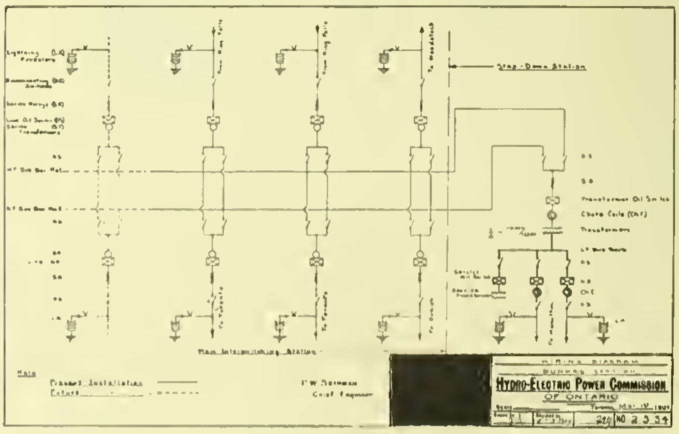


Fig. 4.—Wiring Diagram of Dundas Station.

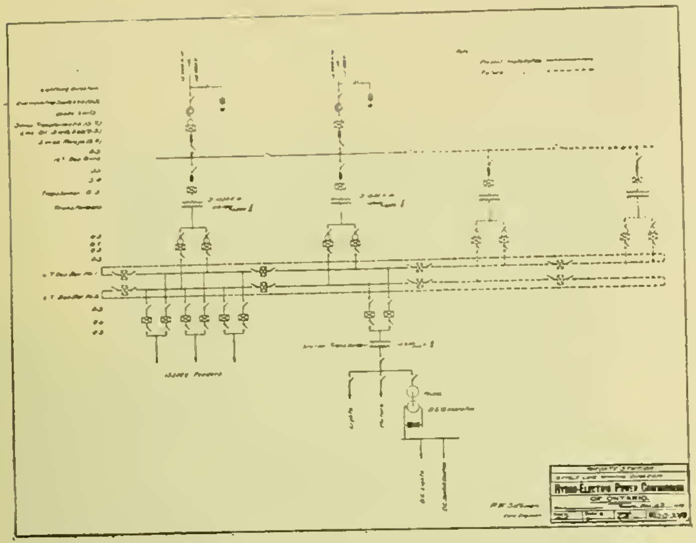


Fig. 5.—Wiring Diagram, Toronto Terminal Station.

building, and in it are located all the high tension transformer and line switches, disconnecting switches and bus bars. The control apparatus is located on a gallery at one end of the building. This gallery is entirely enclosed, but is well provided with windows to give the operator a view of the high tension room. When the building is extended to its ultimate capacity, the control gallery will be in the middle. All oil switches are electrically operated.

The factor of safety which has been adopted is considered to be high. The 110,000 volt bus bars are spaced 6 feet apart, and in no place is a conductor any closer than 3 feet 6 inches to the brick work or steel work of the building. The oil switches are provided with relays, so that should any trouble occur on an incoming feeder in the station, or on outgoing lines, the disabled portion will be automatically cut from the service. Everything has been constructed in duplicate, which means that it is almost impossible for the service to be completely disorganized even for a very short period. In making their exit the 110,000 volt lines pass through the building wall through a bushing, placed in a sheet of plate glass 5 feet square.

The wiring diagram for the Niagara transforming station, shown in figure 1, gives the general connections, and shows both the extent of the present installation and the plans for the future.

The electrolytic lightning arresters with horn-gaps will be located in the rear of the station. Figure 2 is a photograph of the rear of Niagara Falls station, taken on June 7, which shows the concrete piers that have been placed for the support of the electrolytic arresters and horn-gap structures; also the hoods which have been constructed to protect the line bushings from the weather, are 8 feet wide, and are of necessity supported on columns extending up from the ground.

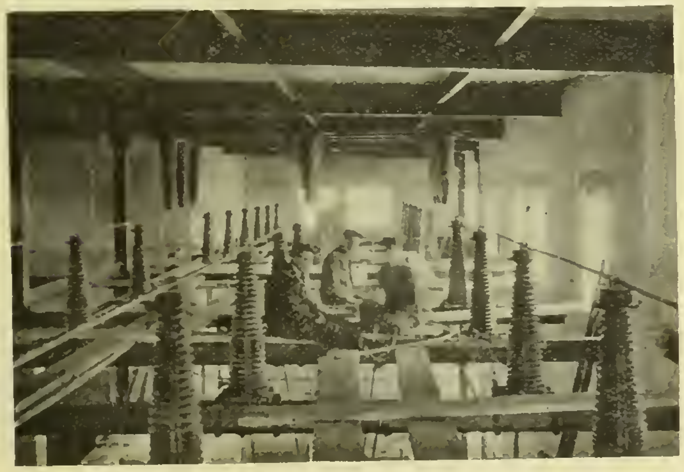


Fig. 6.—High Tension Bus Supporting Beams, Toronto.

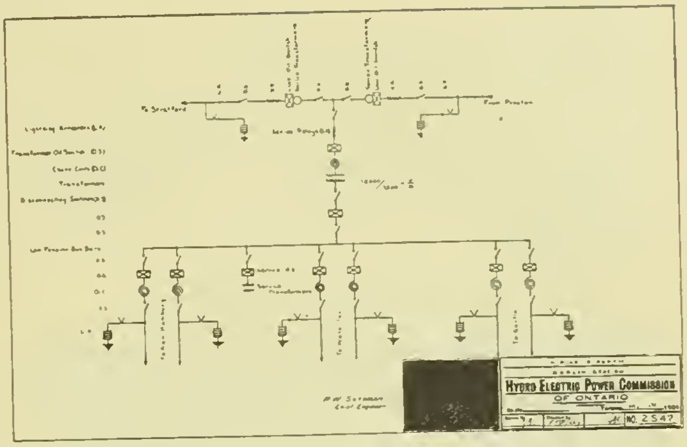


Fig. 7.—Wiring Diagram, Berlin Sub-Station.

The Dundas Sub-Station.

It will be remembered that the main inter-switching station is located at Dundas. From this point transmission lines radiate to the west through Paris and Brantford, to the northwest, including Berlin, St. Marys, etc., and to the east as far as Toronto.

Figure 3 shows the high tension switch room in the station, and figure 4 indicates the plan followed in wiring the station. It will be noted that there are two sets of high tension busses, and connections are so arranged that it is possible to connect each line to either or both busses. The photograph (Fig. 3) shows the leads leaving the 110,000-volt disconnecting switches and passing to the oil circuit breakers. The conductor after leaving the disconnecting switch is carried to the series relay, which is hung on suspension insulators from 110,000-volt bus switches. From there it passes to the circuit breaker terminal. This series relay will operate the tripping mechanism on the switch by means of an insulating rod.

In addition to the protection afforded by these series relays, all lines are provided with a differential relay system. By this system provision is made whereby if any ground, short circuit, or other trouble occurs, in any part of the line, the oil circuit

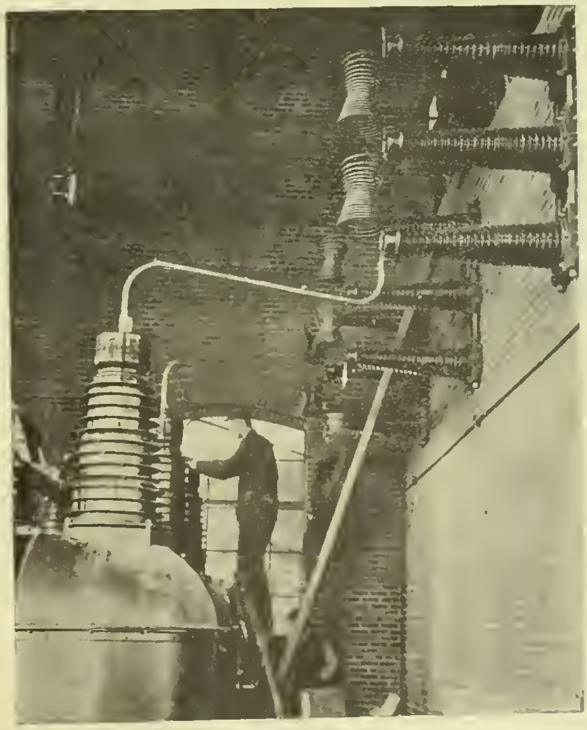


Fig. 8.—Choke Coils and Oil Switches, Berlin.

breakers at each end of the section in which the trouble occurs, will both open automatically.

As all stations in this system, with the exception of one, are on loops, it is easily seen that, should any line become defective, all stations will still be furnished with a source of power from the other side of the loop. For example, should trouble occur in a line between Dundas and Guelph, all the transformer stations beyond Guelph, such as Preston, Berlin, etc., will be furnished with power by means of the line running through Woodstock, London and St. Marys.

The Toronto Terminal Station.

The Toronto terminal wiring diagram is shown in Fig. 5. This is somewhat different from the others in that conditions there require a larger supply of power than the ordinary station will be called upon to distribute. Toronto as yet is not on a loop, but since this city is connected with Dundas by a double line, the loop system actually exists.

Figure 6 represents a photograph taken some time ago of the high tension bus supporting beams in the Toronto station. The insulators are plainly shown and one may judge from the picture what care is being taken to support the 110,000 volt wires and bus bars.

The Berlin Sub-Station.

Berlin station may be considered as typical of all the smaller installations. The plan of wiring can be studied from figure 7. Figure 8 is a view of one corner in this station. Here is shown the mounting of 110,000-volt choke coils, and the connections between them and the 110,000-volt transformer oil switch. The transformers are located just behind the wall on which the choke coils are shown to be mounted. The connections between the transformers and choke coils are carried over this wall, supported by insulators similar to those supporting the choke coils.

Power Equipment of the Western Fuel Co.

In the operation of its extensive mines, the largest on the Pacific Coast, the Western Fuel Company uses electricity in its Nanaimo mines to a considerable extent. The electrical plant consists of three units, two 100 k.w. and one 220 k.w. direct current, 275 volts. The two 100 k.w. are G. E. bipolar, No. 32, and the 220 k.w. generator is of the Canadian General Electric m.p. type. The generators are operated by two Ball engines of 150 h.p. each, and one Robb-Armstrong engine of 325 h.p., the entire electrical equipment being well shown in Fig. 1.

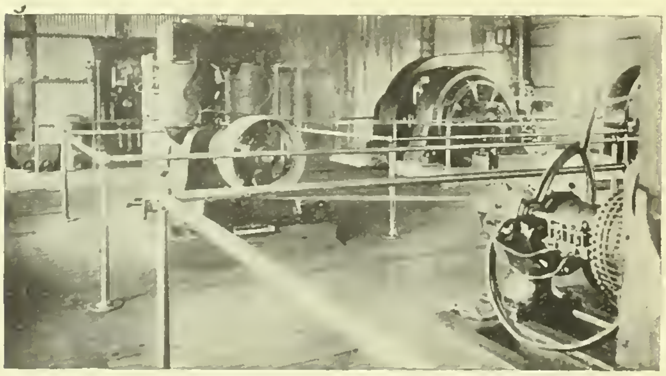
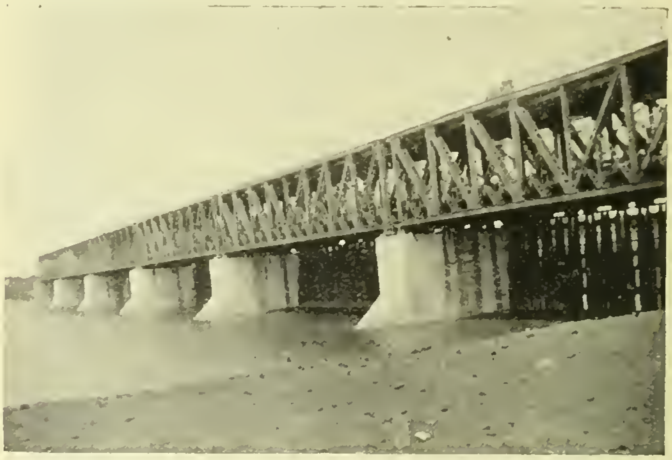


Fig. 1. Generating Station, Western Fuel Co., Nanaimo.

The power generated by this small but up-to-date plant is used both under and above ground. Underground, in No. 1 mine, four electric motors are used on main haulage ways, in pumping mine water, the main lift being 600 feet, heating, lighting the shaft stables, shaft bottom and principal haulage ways, and for operating two electric hoists. Above ground the plant provides all light required around the pit head, machine shops and leading wharves, also furnishing power for the machine and blacksmith shops, and for operating the electric conveyors which are used in conveying coal from the bunkers into steamers' and ships' holds.

St. Andrews Dam Electrically Operated

At St. Andrew's rapids on the Red river, at a point about 15 miles below Winnipeg, a "Curtain" dam and lock have just been completed by the Public Works Department of the Dominion Government, thus making the Red river navigable from Lake Winnipeg to Winnipeg. The dam also furnishes a means for maintaining the level of the Red river at Winnipeg uniform.

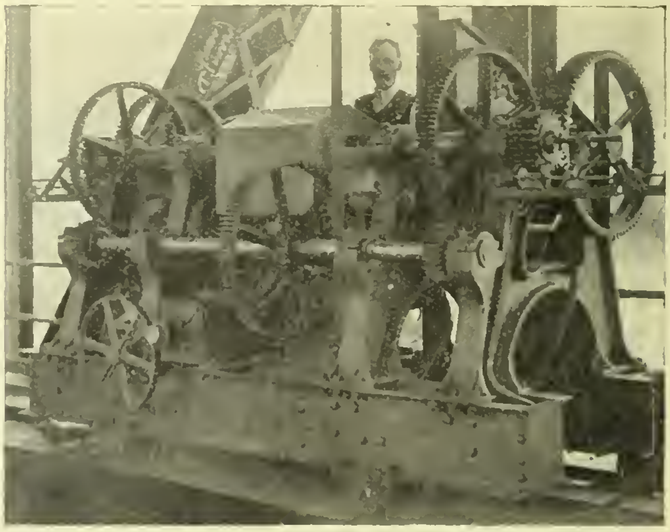


St. Andrews Dam at Red River—Up stream side.—Fig. 1.

From an electrical point of view this dam is interesting since it is operated entirely by motors and is the first one of its kind to be built on the American continent.

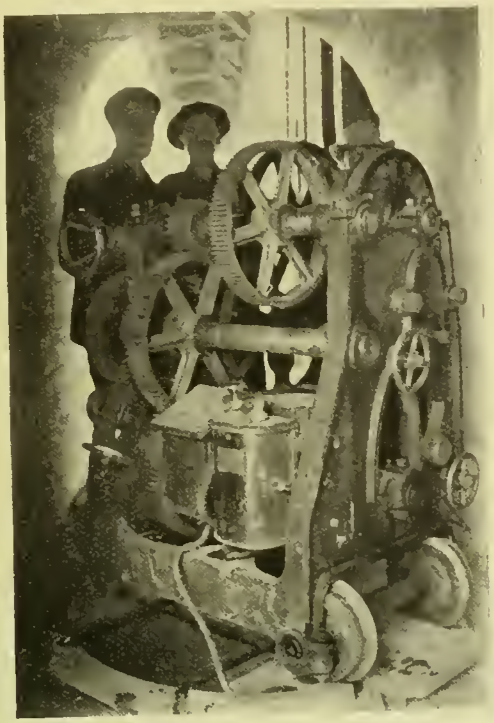
The dam consists of five piers and two abutments supporting a superstructure of six spans. (See Fig. 1.) From the underside of the superstructure hinged frames are suspended, and are let down in the spring and raised in the autumn when navigation is over. Figure 2 shows one of the cranes by means of which the raising and lowering of the frames is accomplished. This crane is operated by two motors, one a 10 horse power, 220-volt crane motor, which raises and lowers the frames, and the other a 2 h.p. motor used to move the crane along the floor of the superstructure.

The level of the water is controlled by "curtains," consisting of a number of wooden battens so connected together and placed on the frames as to be capable of being rolled up or down when



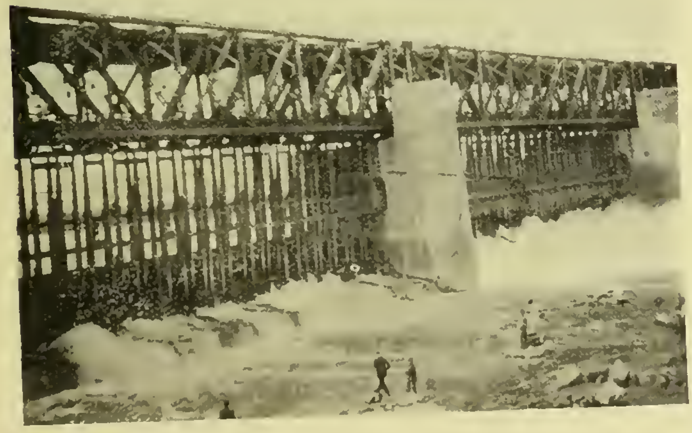
St. Andrew's Dam—Frame Cranes Electrically Operated.—Fig. 2.

the level of the water is to be lowered or raised. These curtains are rolled up or let down by curtain cranes of the type shown in Fig. 3. The curtain cranes work on a platform supported on the down-stream side of the frames when they are in their lowered position, and they can be run from end to end of the dam passing through the openings shown in the piers in Fig. 4, to the point where the curtain is to be adjusted.



St. Andrews Dam—One of the Curtain Cranes.—Fig. 3.

The power for operating the motors and lighting the dam and canal is derived from a steam plant on the east bank of the river, in which there is a 40 k.w., 250-volt direct current, engine-driven generator. A motor-generator of the same capacity has also been installed to take alternating current from the Winnipeg Electric Railway Company, and generate direct current for a "break-down" service. The electrical equipment was furnished by the Canadian General Electric Company, and the construction of the dam was carried out under the supervision of Mr. A. R. Dufresne, until recently district engineer of the Department of Public Works.



St. Andrews Dam—Down stream side. Lower Gallery and Curtains in place.—Note opening in pier—Fig 4.

Big Power Available at Norman Dam

The accompanying sketches represent views of the Norman dam on a branch of the Winnipeg river, near Kenora, Ontario. This is the point where the Reese Engineering Company propose to develop electrical power, of which 2,500 h.p. would be transmitted to Brandon, Man., a distance of 258 miles, 2,500 h.p. to Portage la Prairie, a distance of about 180 miles, and 5,000 h.p. to St. Boniface, a distance of about 125 miles.

Norman Dam, Kenora, Ont., showing discharge.

The dam was built by the late John Mathers, who was engaged in the lumber business at Keewatin, his intention being to use the power for the manufacture of pulp. The project was abandoned, however, on account of the small demand for pulp in Western Canada at that time. The available power is said to be between 20,000 and 30,000 horse power.

Full View of Dam, Controlling 30,000 H.P.

Canadian National Exhibition

Present prospects are that the Exhibition this year will exceed in importance the enviable records of the past. Last year the attendance was over three-quarters of a million, and the laudable ambition of the energetic management is to reach the million mark this year. The scenic effects promised will include many novel features, among them a battle between and airship and a dreadnought, and the elaborate spectacle of a naval review at Spithead. A very interesting exhibit will also be a miniature but exact reproduction of Lord Charles Beresford's famous gunboat "Condor." Music lovers will welcome the announcement that the Band of the Grenadier Guards—probably the finest military band in the world—will present a number of programmes during the Exhibition period.

It is said that every province in the Dominion has already applied for space which should mean that there will be on display the finest collection of Canada's natural resources ever gathered together.

Stave Lake Hydro-Electric Development

Forty thousand horsepower in four units—Construction work well advanced Sluice dam of powerful resistance Another 10,000 available

Stave Lake is situated about 36 miles due east of Vancouver, B.C., and about 12 or 15 miles north from the Fraser river and the main line of the Canadian Pacific Railway. The lake is some 10 miles long, and its source is mainly the Upper Stave river, flowing in from the north; but other streams of smaller size also contribute to the lake supply. The Upper Stave takes its rise in the mountainous and largely unexplored regions northerly of the lake, and is fed by melting glaciers and snowbeds lying in high altitudes. The smaller tributaries of the lake are similarly fed and a number of them may be easily viewed from boat or canoe on the lake, and along in the early summer they present a specially picturesque and magnificent scene, starting from lofty snowbeds, trending to vertical drops of two or three hundred feet, onto rocks at lower elevations, then threading into valleys and perhaps out of sight, until they emerge as brooks at the lake margin.

Those snow-and-ice sources, at elevations not to be materially denuded of their natural forest growth, nor to be polluted by the progress of civilization for generations to come, if ever, afford permanence of volume and consequently enhanced value to the outflowing Stave river, upon which a hydro-electric power plant is under development at the Falls, some six or seven miles below the lake outlet, and only six miles from Ruskin Station on the Canadian Pacific Railway, the point where the Stave empties into the Fraser river.

The Stave flows gently and deep from the lake for the first two miles, then as a ''rapids'' and shallow for a mile, and again placidly and deep for another two and a half miles. The bed of the stream then changes from alluvial soil to a rocky bottom, over which the current is swift and turbulent, for a half-mile run, to a point where the river divides into two channels on the upstream end of a 40-acre island.

On the westerly branch, and within a hundred feet of the fork of the river, there is a natural falls comprised of a series of cascades, aggregating a couple of hundred feet in length. The easterly branch makes a descent of some fifteen or twenty feet in a run of 400 or 500 fet from the fork, then a sheer fall of 50 or 60 feet, corresponding with the falls of the westerly branch.

The head of the island was deemed an ideal location for damming the river and developing a water power.

The easterly stream carried some two-thirds or three-fourths of the total volume, and the westerly the balance, the respective proportions varying somewhat according to the stage of the river. The scheme decided upon by the engineer was to erect a concrete dam across the westerly channel at the crest of the falls, the structure to contain steel-cased apertures, or bellmouth inlets, for steel flumes about 250 feet long, to lead downward over the slope or bed of the falls, to a power house to be built across the channel at the foot. The effect of the dam would be entirely to stop the westerly flow, excepting that quantity to be conveyed through the flumes and utilized in driving the turbines. Another part of the scheme provided for a sluice dam, also of concrete construction, to be built across the easterly branch, at a point about 100 feet upstream from a projected line of the intake or westerly dam, the two dams to be united by a concrete wing dam paralleling the general line of the river, and dividing the forebay, from the run of water wasting through the sluice dam.

The upstream end, or nose, of the wing dam, stands where the extreme upstream point of the island stood at lowest water.

At certain extreme spells, of only a few days duration, the volume of flow from the lake and over the falls has dropped to rather less than 2,000 second-feet. Carefully kept records show that such a condition might happen in January, in Febraury, October or December. The same records show that the greatest flood of the year might occur in September, November, or early December, and its volume reach between 40,000 and 50,000 second-feet for a two or three-day run. Moderately heavy freshets are also liable to occur in March and October.

The natural cross section of channel at either side of the island was quite inadequate to accommodate the whole volume of the river at flood season, without probability of creating more or less damage to property on the river above, and around the lake also. The easterly channel was sufficient for the whole flow, without undue flooding, between May and September, though June and July run is usually strong.

After removal of a heavy log jam of huge and medium-sized logs and trees, accumulated at the entrance of the westerly channel, between the head of the island and the westerly shore, various obstructing rocks were blasted from the river bed and shores, between the temporary dam and the crest of the falls. The purpose was to prevent a recurrence of timber jams, and to enlarge this smaller channel sufficiently to take care of the greatest known summer flow when later on, the temporary dam should be removed and the entire run of the river turned in during stoppage by temporary dam, and enlargement of the easterly channel, and the construction of the massive sluice dam piers in its bed.

Stave Lake Sluice Jam—Up-stream side without stop logs.

The plan provided that the dams be built some 34 feet above river bed elevation, creating, with tailrace excavation, from 90 to 95 feet effective head. That elevation of dam also provided for a lake storage of from 6 to 7 feet depth above normal lake level.

Reorganization of the power company and the enlargement of its financial scope led to increasing the height of dam to an elevation for 100 feet working head, and changing the plan from five units of 6,000 h.p. each, to one of four units of 10,000 h.p. each, in addition to two independent exciter units in either instance. With the enlarged storage capacity at the lake and the greater working head at the power house, the plant when completed will be in a position to market 40,000 h.p. at lowest stage of river flow. The storage of water controlled by the present height of dam amounts to between 12 and 15 square miles of area. Provision has been made for further increasing the elevation of dam and lake storage, to yield at least another 10,000 h.p. when required.

A leading feature in the hydraulic scheme is the sluice dam and its stop-log system. Four concrete piers are erected in the enlarged bed of the easterly branch of the stream. An abutment pier at the easterly shore and the wing dam at the westerly (on the island), together with the piers, form five sluices, varying in depth from 32 to 37 feet, and having uniform width of 22 feet each in the clear. Stop-log checks, of steel, are formed in the piers, abutment and wing dam, 12 inches deep and 18 inches wide, and extending from top to bottom of the sluices. The bottoms of the sluices are of concrete and each has an anchored sill of British Columbia fir imbedded to within an inch of its top face. The sills are 24 inches square and extend across the sluices from back to back of the stop-log checks. The stop-logs are likewise of fir, bolted together in pairs, each log having a depth of 16 inches (32 inches to the pair), and a length of 23 feet 10 inches. The widths vary from 24 inches for those near the sluice bottom, to 16 inches for those near the top.

A pair of travelling winches, (shown in view), operated by electric motor, or by hand in case of emergency, move along a track over the piers, from sluice to sluice, and insert or remove the stop-logs as may be required. The winches are capable of manipulating the stop-logs in any one sluiceway, regardless of the depth or swiftness of water flowing through, and lift out or insert the lower stop-logs with the same precision and effectiveness as the upper ones.

The river is subject to sudden fluctuations, the surface elevation rising sometimes as much as twelve feet within forty-eight hours, and the total variation is over 16 feet between extreme high and extreme low water. The elevation of the lake surface is likewise subject to as great variation, under natural conditions. In designing a dam to give such excessive and quickly required vent and yet capable of controlling the greatest possible proportion of the water, it was clear that some type more economical than the ordinary overflow dam and more certain of action than the common waste-gate style, must be adopted where British Columbia fir trees in their entirety, logs, shingle bolts and debris, are frequently afloat and on the rampage. The simplicity and liberal discharging capacity of a sluice dam to comprise five sluices, each 22 feet wide in the clear, and over 30 feet in depth, and equipped with staunch wooden stop-logs reliable for quick removal and as quick replacement, was deemed the solution of the problem.

Stave Lake—Stop log dam under construction.

The concrete piers for the sluice dam were built in the summer of 1907. They are strongly anchored to their rock foundation, are reinforced with steel and protected with half-inch boiler plate nosings. The intake dam, the power house and excavation of tailrace, as well as construction of a spur line of railway from the C. P. R., are all works now in hand. The steel flumes from the intake dam will be 14½ feet internal diameter, with two independent flumes of smaller diameter for the exciter drives. The headgates of flumes are planned to be of the pivotted type and of steel construction. Stop-logs will also be provided for emergencies.

Stave Lake—Up-stream side of stop log dam—travelling stop-log winch shown on left side.

The turbines have been contracted for and will be of Swiss construction. The purpose of the plant is to generate electric power for transmission to Vancouver, New Westminster, and other centres, for operating tram lines, industrial plants, and for furnishing light, etc. A temporary hydro-electric plant of some 10 or 15 hundred horse power, has been installed and operates the various derrick engines, rock drills, saw mill and machine shop, all engaged on the construction works, and also furnishes light for the camp buildings and grounds. An important use of the temporary power plant will shortly be found in the running of the electric railway, soon to be completed for transportation of supplies between Ruskin Station and the power site.

The work was commenced and actively carried on for some three years by the Stave Lake Power Company, Limited, but has been taken up by the Western Canada Power Company, of which Mr. C. H. Cahan, of Montreal, is the president, and Mr. John Hendry, vice-president; Mr. R. F. Hayward, general manager and chief engineer, and Mr. Wm. Kennedy, C.E., of Montreal, consulting engineer.

For the above description of the project we are indebted to Mr. James C. Kennedy, C.E., who was for three and a half years the successful engineer in charge, until his recent retirement to conduct private practice in Vancouver, B.C.

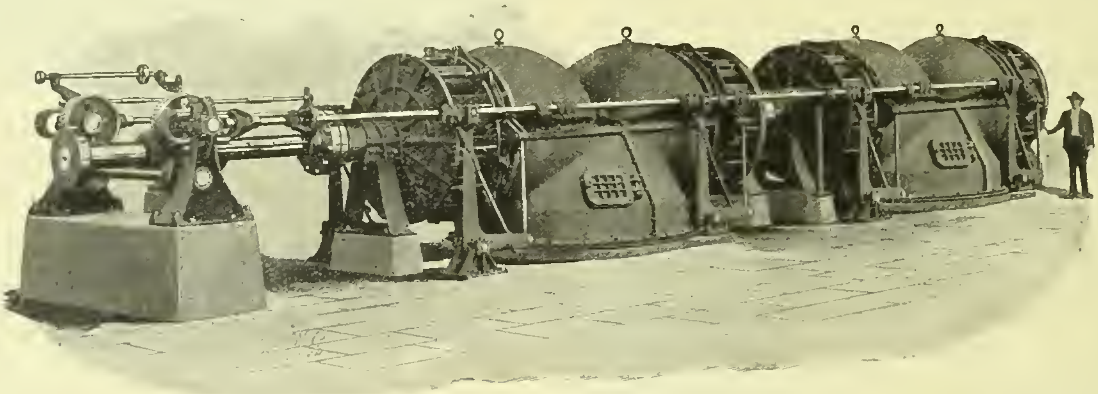
Winnipeg Branch for Canadian Tungsten

To insure prompt deliveries and to enable them to look after their customers more closely, the Canadian Tungsten Lamp Co. are opening a branch at 518 Somerset Block, Winnipeg, with Mr. W. E. Skinner as manager and representative. They intend carrying a full stock of all their lines, and with Mr. Skinner looking after this portion of the business, prompt deliveries and careful attention to all business are insured. Mr. Skinner, who has been making an extended tour through the East, spent some time in Hamilton at the head office.

Hydro-Electric Plant for Lumber King

J. R. Booth Installing 5000 k. w. Capacity—S. Morgan Smith Waterwheels used—A. C. B. Generators—Lombard Governor described

J. R. Booth, Canada's lumber king, whose mills' daily cut of lumber runs into a million feet, and who has just completed a new 5,000 k.w. hydro-electric installation, has for a great number of years been operating his scattered mills and other plants with waterwheels isolated in flumes about his large property. These many installations and many sonrces of power supply did not give an efficient development, so the decision was arrived at that the most beneficial method for all his requirements would be to use all the water he could at one point, and to put in an hydro-electric development from which power could be delivered to the different mills for motor operation. So it was with this end in view that the present plant was started. It must be understood that this is not the sum total of J. R. Booth's power at the Chandiere, for on account of the nature of some of his installations it was impossible to change over to the hydro-electric plant. For instance, in the large pulp mill he had installed, some two years ago, waterwheels aggregating 2,000 horse power. This was a most up-to-date equipment and could not be sacrificed. Then in the paper mill a steam plant had been installed of 1,800 horse power, of Robb-Armstrong horizontal type engines. This plant, too, will be kept on, as it is modern and efficient in every way, and also in that much steam is required for drying purposes in the manufacture of paper, it is well suited to the requirements put upon it. This new hydro-electric plant, as it is applied here, is the most advanced step in its application to lumber mills, for the source of power supply is isolated at one point, installed in the most efficient manner with nothing but first-class equipment, so the chances of a complete shut-down are very remote, indeed, and it is conceded to-day that individual drive is the most economical both as to efficiency and reliability, for if anything should go wrong with any part of anyone of the plants it is only necessary to shut off power on that circuit till the damage is repaired and not as heretofore to shut out the water from the complete mill. Anyone can well understand the great loss a mill would be put to if for any reason it was necessary to shut down completely, as is bound to happen at times with the old style of power supply.



S. Morgan Smith Turbines Operating J. R. Booth's Electric Plant, Ottawa

The hydro-electric plant is to supply power to his various mills, such as pulp mill, sulphite mill, paper and paper board mills, saw mill, acid plant, machine shops, etc. All these industries are situated in the immediate vicinity of the power plant.

This development is some three hundred feet below the Great Chaudiere Falls, on the north side of Victoria Island, at the Chaudiere, in the city of Ottawa. Intake is made some 800 feet above the station site. This development when complete will have an ultimate capacity of 9,000 k.w. Water is carried in a closed flume to the power house, giving a head of 27 feet. This is an interesting plant inasmuch as very great quantities of concrete and steel were used on account of difficulties of construction, the power house being built, as it were, on the sheer wall of rock.

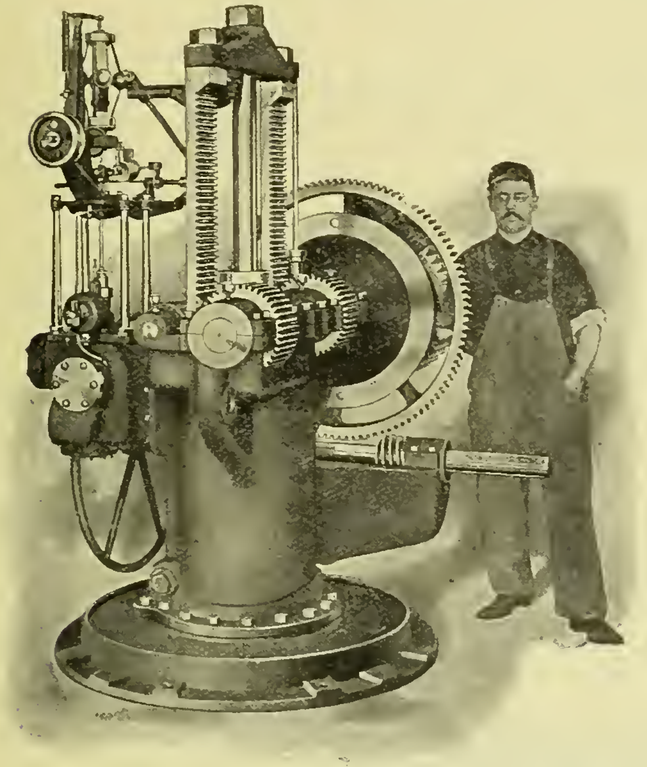
S. Morgan Smith waterwheels are used, each unit being made up of four 51-inch horizontal type wheels of 700 k.w. each, connected together upon one shaft. These wheels are rated upon a head of 27 feet at 160 r.p.m. Lombard governors, type N. 14, are provided for their regulation. The power house proper is some 125 feet by 40 feet. Along one side is a large operating gallery upon which the distributing switchboard is placed. This board is of standard "General Electric Company" design, and comprises fifteen panels in blue Vermont marble. At present there are installed two Allis-Chalmers-Bullock, 2,500 k.v.a., 600-volt, 60-cycle, 3-phase revolving field type generators, direct connected to the above described S. Morgan Smith wheels, and one A.C.B. 450 k.w., 125-volt d.c. exciter, direct connected to an S. Morgan Smith waterwheel, controlled by a Lombard type D governor. Several generators and small motors are yet to be installed for special purposes.

As stated above, the governors in this installation are what are known commercially as the Type N-14 governors, made by the Lombard Governor Company, of Ashland, Mass., which are claimed to be the most powerful governors of standard make on the market.

These N-14 governors develop 60,000-foot pounds in the act of opening or closing the waterwheel gates. They develop that amount of energy in two seconds, or may be adjusted for slower operation. The methods of adjustment are such that the governor can be made to work faster or slower while the plant is in operation, and without putting the governor out of commission. Likewise, the sensitiveness may be varied while in operation. These governors consist primarily of a hydraulic cylinder the piston of which is controlled by oil under tank pressure, through the instrumentality of a valve mechanism which is actuated by the centrifugal balls.

The cut does not show the pumps, which maintain the oil pressure, nor the pressure and vacuum tanks into which and from which the pump circulates the oil through the governor.

Control from the switchboard is arranged in such a way that it is possible, by manipulating fast and slow switches, to make the waterwheels run faster or slower at the will of the operator. This device is of great use in getting the generators into th same angular position for parallel operation. In fact, the distant speed controller on these governors permits of such accurate adjustment of operating speed as to allow of very deliberate paralleling of the generators. The hand control mechanism is of a simple and yet somewhat novel design. It consists of a worm and worm wheel which, of course, locks the waterwheel gates into any desired position at the will of the operator; yet by manipulating a split collar the worm is immediately thrown out of mesh with the worm gear so as to permit the governor to have free control of the gates.



Lombard Governor Installed in J. R. Booth Plant

A noticeable feature in this power house is the arrangement for handling the equipment,—a large travelling crane mounted upon tracks, which run the length of the power house, and out at one end upon suitable supports. The whole end of the power house is formed of windows, which may be readily removed. Aside from this valuable feature of facility in handling heavy equipment, first class lighting of the power house is secured during all hours of daylight. The construction and installation of this development has been under the direct supervision of Mr. Fred. Booth, Mr. Smith being superintendent.

Trade Enquiries

803. **Electric Light Fittings.**—A London firm of designers and manufacturers of electric light fittings wish to get into communication with architects and decorators in Canada.

810. **Water Turbines.**—A Swedish firm manufacturing water turbines are desirous of entering the Canadian market.

840. **Agents.**—A London firm manufacturing metal filament and carbon electric lamps wish to appoint agents at Montreal, Quebec, Ottawa, Toronto, Winnipeg, Vancouver, etc.

981. Cast iron car wheels, electrical goods, etc, etc.—A Newfoundland company usually purchasing their goods in England and the United States desires Canadian exporters to quote them prices on the following goods: cast iron car wheels, electrical goods, including wire, fixtures, motors, transformers, lamps, etc., track spikes, boiler plates, boiler rivets and nuts, channel and angle iron, gasoline and kerosene oil engines, pick, sledge, hammer, shovel handles, brass valves, babbitt metal and solder.

993. Agents.—A London firm manufacturing electrical and mechanical fans wish to appoint Canadian agents.

1043. Electrical goods.—A Birmingham firm manufacturing portable electric hand lanterns, electric dry cells of various kinds, electric pocket lamps, torches, accumulators, weather-proof bells, wood-cased bells, electrical accessories, dynamos, motors, switches, fittings, etc., wishes to enter the Canadian market.

1053. Agents.—A London firm representing manufacturers of pressure turbine pumps, electric haulage engines, lifts, cages, etc., would like to get into communication with Canadian engineering firms prepared to act as their representative.

1125. Agents.—A Manchester firm is desirous of obtaining agents in Canada for the following articles: (a) Hydraulic and sanitary plant (pumping plant, etc.); (b) hydraulic, electric and hand lifts; crabs, cranes and winches, etc.; (c) street railway cars, railroad cars, cars and wagons of all descriptions.

1160. Agent.—A London firm manufacturing arc lamps, transformers and metallic filament lamps, are open to appoint an agent for the province of Ontario.

1173. Agency.—A London firm of manufacturers of electrical accessories are desirous of appointing a substantial firm in Canada for the sale of a patent cold lacquer suitable for brass, copper, electrical, ship fitting and kindred trades.

Trade Publications

The Canadian Carbon Company are distributing a sheet showing in tabulated form the results of a series of very satisfactory tests on the output of their X-cell dry batteries.

Mine Telephones.—Bulletin No 1000, issued by the Stromberg-Carlson Telephone Manufacturing Company, describing their various types of mine telephones and showing the best plan of making the installation.

Ohio Brass Company have recently issued a new general catalogue, No. 8, describing and illustrating their complete line of overhead material, rail bonds, construction material, car equipment specialties, etc.

Power Pumps.—Catalogue No. 7, issued by the Smart, Turner Machine Company, of Hamilton. The catalogue is devoted to power-driven pumping machinery and accessories. The information is complete, well catalogued and fully illustrated.

Arkless Fuses.—Arkless fuses, the "guaranteed to indicate" kind, are illustrated and described in price list No. 16, now being distributed by the Detroit Fuse & Manufacturing Company, Detroit, Mich. This price list contains complete information in condensed form, making it valuable to fuse purchasers, and will be forwarded on request by the manufacturer.

Common Battery Telephones.—Pamphlet No. 29, descriptive, with illustrations, of the different types of telephones manufactured by the Stromberg-Carlson Telephone Company, Rochester.

Motorman's Valves.—Bulletin No. 388 issued by the National Brake and Electric Company describing their various types of motorman's valves for use with air brake equipments.

Catalogue of Scientific Books.—A new revised edition of D. Van Nostrand Company's Catalogue of Scientific Books, Part II.—Electricity. This gives, classified under thirty-two subject heads, the name, price, size and a brief description of about nine hundred books treating of electricity and its applications. Sent free on application.

Emergency Valves for Air Brakes.—Bulletin No. 389, issued by the National Brake & Electric Company, of Milwaukee, descriptive of their emergency valves for use with the straight air brake where cars are operated two or more together.

The Canadian Electrical Convention

President. Coate

The members of the Canadian Electrical Association met in convention at the Royal Muskoka, Lake Rosseau, on July 6th, 7th and 8th. The convention was a decided success. The attendance was large, the weather good, and the Muskoka Lakes and the Royal Muskoka were looking their best. Indeed, the attractions of this ideal summer resort were so many and so varied that the convention sittings would undoubtedly have suffered had the programme of papers been one whit less important or interesting. Wisely, under the circumstances, the meetings adjourned in the early afternoon each day, allowing ample time for such recreation as boating, fishing and games as the strenuous work of the morning demanded. Space does not allow us to name individually those whose enthusiasm and interest made the convention the success it was, but to all much credit is due.

The Banquet.

The evening banquet on the second day of the convention took on something of an international character on account of the number of distinguished guests from without Canadian borders. The speeches in response to the toasts were unusually good. Mr. Frederic Nicholls, replying to the toast of Canada, in a delightfully optimistic strain, gave a comprehensive review of Canada's resources and prospects. Mr. T. C. Martin, former editor "Electrical World" and now secretary National Electric Light Association, Mr. W. W. Freeman, President, N. E. L. A., Mr. C. F. Scott, consulting engineer, Westinghouse Company, and Mr. Leonard Andrews, consulting engineer, London, Eng., replied for sister societies. The central station interests were upheld by Col. Street and Mr. C. A. Littlefield. Messrs. F. A. Merrick and L. J. Belnap spoke for the manufacturers. Major MacLean, proprietor of the "Electrical News," in his usual happy strain, upheld the dignity of "The Press." The ladies' interests were enthusiastically championed by Messrs. Dion and Bucke.

The New Committee.

The Managing Committee for 1910-11 is composed as follows:

P. S. Coate (President), Chatham Gas Company, Chatham, Ont.

E. A. Evans (1st Vice-President), Quebec Railway, Light, Heat & Power Company, Quebec, Que.

W. L. Adams (2nd Vice-President), Ontario Power Company, Niagara Falls, Ont.

T. S. Young (Secretary-Treasurer), Confederation Life Building, Toronto, Ont.

A. A. Dion, Ottawa Electric Company, Ottawa, Ont.

R. G. Black, Toronto Electric Light Company, Toronto, Ont.

J. J. Wright, Toronto Electric Light Company, Toronto, Ont.

W. N. Ryerson, Great Northern Power Company, Duluth, Minn.

A. L. Mudge, Smith, Kerry & Chace, Toronto, Ont.

L. V. Webber, Toronto Electric Light Company, Toronto, Ont.

W. L. Bird, Kaministiquia Power Company, Fort William, Ont.

R. F. Pack, Toronto Electric Light Company, Toronto, Ont.

F. A. Chisholm, St. Johns Electric Light Company, St. Johns, Que.

D. H. McDougall, Toronto & Niagara Power Company, Toronto, Ont.

The Convention Programme.

The excellence of the various papers would amply justify their reproduction in full had we the necessary space at our disposal. This plan, however, would also delay unduly the plac-

A Group of Members of the Canadian Electrical Association in Convention at the "Royal Muskoka."

ing of some of the papers in our readers' hands and, therefore, we merely publish a review of each item of the programme in order that the whole field may be covered in the present issue. While not claiming to give an accurate representation of the subject matter of these various papers, the reviews will aim, nevertheless, at placing before the reader such a definite outline of the questions discussed by the different writers that he will be in a position to judge whether he wishes to study the subject more deeply by a perusal of the original. In such cases the full text of the papers will be available from the secretary of the Association, and will also later be printed in the proceedings of the Canadian Electrical Association.

Some Practical Considerations Concerning Contracts

By W. N. Ryerson, President.

In welcoming the members of the Canadian Electrical Association to their 20th annual convention the president decided to depart from the usual custom of giving a review and prognostication regarding matters electrical, and gave instead a paper touching on some practical considerations concerning contracts for lighting and power service.

The making of a definite contract is very important. The terms, however, should be in the simplest possible language so as to admit of no misinterpretation, and should be submitted, without fail, to a recognized legal authority before execution. In plants of considerable size a competent engineer should always be consulted as to the terms of contract.

The paper then mentions, item by item, with short explanatory note in each case, the different points which it is absolutely necessary to include in a properly drawn up contract, as follows:

Term of Contract.—The larger the contract the more important a long term of years. A very ordinary form of contract is made for a definite term with privilege, on both sides, of renewal from term to term, with or without provisions for revising the rates.

Price Charged.—Express the methods of charging in the simplest possible language, and if practicable give an illustration showing a simpler bill under given assumptions.

Uses of Current.—In power contracts it is usual to state the particular use to which current is to be put.

Point of Delivery.—This is important in all contracts. It should be very clearly and definitely stated where the producer's responsibility ends and the customer's begins.

Meters.—It is well to define the type or style to be used, also who is to furnish and maintain them. Insert a stipulation that proper and sufficient space on the customer's premises be furnished for installation for this and all other necessary apparatus.

Access to Customer's Premises.—At all legitimate hours the employees of the company must be allowed to freely enter the customer's premises and inspect or repair apparatus.

Balancing of Phases.—Only applicable to certain kinds of current. Some contracts provide a penalty for unbalancing in the way of an increased charge if a certain amount is exceeded.

Power Factor.—Some companies stipulate that a certain power factor must be maintained. This item, as well as the previous one, is apt to lead to misunderstanding between customer and producer. The safe way to avoid trouble is to see that the customer instals proper and approved apparatus, and that it is intelligently cared for.

Non Payment of Bills.—Usual to state a date before which accounts must be paid. Some companies give discounts before a certain date, others add percentage after the fixed date. The latter method is better, as large discounts become associated in the mind of the consumer with large profits. The power to shut off current or cancel a contract in case of non payment, should certainly be included.

Interruption to Service.—The ever-increasing necessity for continuity of service is making this clause imperative. Provision may be made, however, for interruptions at certain specified hours for repairs, etc. It is usual to provide that no penalty shall ensue for failure to deliver under certain stated conditions such as catastrophes and other causes beyond the control of the generating company after the exercise of due care and diligence, but the consumer should have a similar protection against charge in the event of like happenings to his plant or equipment.

Excess Power.—Insert a proviso that requirements in excess of the original contract must be taken from the same company.

Arbitration.—A clause should define the manner of appointing arbitrators, and the plan of procedure to be followed by them.

Supervision of Customer's Apparatus.—Insofar as it is necessary for the company's protection, supervision of the customer's installation should be allowed. Every care should be taken to have the customer purchase only the most reliable apparatus. In lighting contracts the wiring should either be made according to some set of rules such as those of the fire underwriters or subject to the company's inspection.

Definition of Delivery.—Usually expressed by stating that the maintenance, at the point of delivery, of the voltage and frequency agreed upon, shall constitute delivery whether customer actually uses current or not.

Mr. Nicholls Arranges a Yachting Party.

Voltage of Supply.—Where the nature of the load is likely to cause considerable variations it is well to state that the delivered voltage shall be between two given limits and to see that the customer purchases his transformer with suitable taps to enable him to obtain the required voltage under those varying conditions.

Frequency.—Not well to tie the company down to any definite figures. Agree that it will not vary to such an extent as will prevent the commercial operation of the customer's apparatus when this is properly designed and installed to receive power from a miscellaneous system supplying varying loads.

Mutual Liability.—A mutual agreement by which both the company and the consumer agree to hold themselves responsible for loss or damage sustained by any person whatsoever, according as the loss or damage is due to the negligence of the company or the consumer, their officers or agents, construction employees, or to the maintenance or operation of the plant or any machinery, appliances or apparatus used in connection therewith, should be arranged.

Definition of Terms.—Clearly define any terms of a technical nature, e.g., kilowatt hour.

Assumption of Liability to Successors or Assigns.—Should be in any contract, except the very smallest retail lighting documents.

Delay in Delivery or Use.—Both parties should be absolved from liability in the delivery or use for reasons beyond its control, but the time, if possible, should be limited to a specified period. Prevention of delivery or use by injunction or other court proceedings should be mentioned.

Deposit or Other Guarantee.—Sometimes customary with small current users to require a bond or deposit, to be returned when contract expires.

Lamp Renewals.—It should be clearly stated whether the generating company furnishes lamp renewals, and if so on what basis, whether the lamps are delivered to the customer, and what type of lamp is furnished free of charge, if any.

The paper further emphasizes the necessity for simplicity of contract with small consumers. This may often take the form of an application signed by the consumer and accepted by the company. With larger contracts a more formal document is preferable. Rates for current should be explicitly stated and printed in the contract. This is especially important in view of the certainty of all public service corporations, both in Canada and the United States sooner or later coming under the supervision of public service commissions, who will certainly appreciate justice and uniformity in methods of charging.

The Commercial Agent and the Community

By C. A. Littlefield.

The growth of an industry is largely dependent upon the energy of the individual who develops the demand for the commodity but the personality of this individual is very important. The personality of the agent becomes associated in the public mind with the commodity he sells. Great care is necessary therefore in the selection of representatives. Many industries are placed at a disadvantage by improper representation. In the electric business there is a large field that must be cultivated, a large number of prospects who through ignorance of the advantages of electricity, or prejudice, or real or imagined economy will not voluntarily make use of electric service. The commercial agent must be the type of man who can get this business.

The paper consists mainly of a description of the commercial department of the New York Electric Company, where the canvassing may be said to divide itself broadly into two divisions:

1. The direct method—meaning that which is obtained through direct solicitation by agents.

2. The indirect method—including the business which results from advertizing, signs, displays., etc, and without direct solicitation.

To care for the direct method work the contract and inspection department is divided into a number of bureaus, each having direct charge of a particular phase of the work, as follows:

1. **Wholesale and New Building Bureau.**—It is the business of this bureau to obtain early information from every available source concerning projected buildings. This is followed by an energetic canvass, maintained until the contract is signed or a private plant decided on. The wholesale bureau also studies the conditions by which a retail consumer may enter the wholesale class. By this change the consumer may often use more current and actually pay less. It is the policy of the company to consult the interests of its customers, and by a careful study of the individual accounts, give them the advantage of the cheapest rate.

2. **Private Plant Bureau.**—This bureau prevents, if possible, the installation of a private plant. If unsuccessful in the first attempt, careful study is made of operating costs and a continued canvass kept up to show the consumer the advantages of central energy as compared with his private installation. In 1909 this bureau succeeded in closing down forty private plants.

3. **Power Bureau.**—To extend and develop electric power business in existing and new factories. Existing conditions are studied and comparative figures presented to show the advantage of the Edison service.

4. **Sign Bureau.**—To extend the use of electric signs. The “Great White Way' has developed from one large sign erected in 1892.

5. **Automobile Bureau.**—Works with and through the manufacturers to secure the charging from the Edison service.

6. **Heating Bureau.**—Concerns itself with the various branches of electric heating. Demonstrators are constantly employed who responding to calls for information and by original canvass, extend the use of electric appliances.

7. **Follow-up Bureau.**—Receives data from the other bureaus and mails series of letters at regular intervals bearing on the subject canvassed for.

8. **Engineering Bureau.**—An engineering staff that does no canvassing, but works with all the bureaus. This bureau makes a detailed scientific study of any lighting, heat or power problem met with in the other bureaus and reports back to them..

District Offices.—The retail section is divided into five districts, each in charge of a district manager. Districts are again sub-divided and each sub-district has an inspector-agent who is supposed to be familiar with all sections of his sub-district, and to know the character of the illumination of the various streets. This inspector-agent makes frequent calls upon prospective customers and reports to the district manager, who, in turn, reports to the Follow-up Bureau. The term inspector-agent, as the words imply, means that the holder of this office, not only canvasses the customers, but oversees and inspects the installation.

The President's Family and Mrs. Pope of Strathroy.

Complaints.—Two bureaus have been organized, one having charge of complaints as to excessive charging, the other looking after more general complaints. Sometimes complaints come in that are the result of improper installations and for this work a special illumination bureau composed of men in touch with advanced illuminating engineering, has been created.

Relations with Contractors.—A tactful co-operation can be depended on to increase business. Their active opposition may easily be the cause of many private installations.

Rates.—Make the system of charging as simple as possible, especially to the small consumer. The author makes a strong plea for the elimination of fixed charges, except when figured into the rate itself, at the same time recognizing that theory and the majority of central station managers are against him.

Needs of a City.—Study the needs and wants of the different sections. Better get the good will and co-operation of a section than secure immediate business by an arbitrary policy that might antagonize. Brilliant signs may suit the merchants on one street, while another kind of illumination may meet the wishes of another street. Co-operate if possible and then follow up the plan adopted, aggressively.

Office Attitude.—The public will not tolerate discourteous treatment. Make it a pleasure for customers to do business in the office or with the employees. The company expects every man to do his duty having in mind the interests of the community as well as the increment of the company, for in striving for the one you accomplish the other.

Discussion.

Mr. Ryerson's and Mr. Littlefield's paper were discussed together. **Mr. Dion** thought these both along the right lines. The Ottawa Company sells power with reference to the power factor which is fixed at 90. He did not agree with the paper on the payment of bills and thought it difficult to impose a penalty as suggested. Mr. Littlefield's paper applies to larger companies. This is the first time a straight kilowatt rate had been advocated and coming from a representative of such a large company it justified careful consideration.

Mr. Pack.—Difficult to have fixed form of contract for large power users that will cover all the various conditions for which the power is used. In regard to small consumers and in contracts for light and power in small quantities, absolutely necessary that there be no discrimination. Any differentation should be made not as regards individuals, but as groups. He questioned the legality of penalty for non-payment of bills. Discount should be small. The mutual liability clause is a very dangerous one; in case of fire the insurance company may repudiate its liability. Where deposit is asked, as guarantee of payment, interest paid yearly should be allowed.

Harry Strickland and E. A. Greene.

Mr. Bucke referring to Mr. Littlefield's paper, commended this method of getting after business. It is necessary to keep in mind the interests of the consumer.

Mr. Black also objected to the Mutual Liability clause, as loading the company with great responsibilities. Believes in a larger classification of contracts—ten or perhaps twenty different classes of contracts may be required to supply different classes of load.

Mr. R. J. Smith agreed with Mr. Littlefield in doing away with the readiness to serve charge. Customers simply pay for what they use. The simpler the contract the better. Public confidence a great asset.

Mr. Littlefield stated that his company were compelled to file in every one of their offices where the public can view them, and with the Public Service Commission, a statement giving the forms of contract used. These conracts cannot be varied without permission of the Public Service Commission.

Mr. Mudge.—Where a power company locates a substation on a customer's property, it is well to reserve right to place poles and wires and deliver power from that station to other customers. It is well to specify that a customer cannot sell power to other people.

Mr. Chisholm.—In Quebec the rule is that, in selling current of any sort, the voltage must not vary more than 5 per cent. either way. The penalty is a $25 fine.

Mr. Adams.—The point of delivery, referred to in Mr. Ryerson's paper, a very important question. Sometimes lines have to be run in very awkward places as the customers' apparatus is badly installed.

Protection of Service in Large Electric Systems

By A. S. Loizeaux.

The protection of an electric system to insure against any break in the service is daily becoming more essential, especially in the larger towns and in cities. The paper deals with the subject of insured continuity of service under all the various subheads which, either directly or indirectly, play a part in producing the desired result.

Buildings.—All power houses and substations should be very substantially built and, as far as possible, fireproof. Wood is being eliminated and replaced by metal or non-inflammable material, such as asbestos, lumber. Heavy fire walls are used to subdivide buildings. The various rooms are connected by double fire doors. The switchboard operating rooms are often seperated from the generating rooms; this may be done by wired glass windows, which enables the operator to see the generating units.

Additional Fire Portection.—Where land is not too expensive the electric service buildings should be isolated as a protection against fire from nearby buildings. Extinguishing a fire in an electric station by water is objectionable on account of damage to the apparatus. Chemical entinguishers are often of great value. Of these, carbon tetra-chloride (pyrene) possesses remarkable properties of extinguishing flames by the formation of gases. In addition this chemical substance is a good electric insulator.

Fuel Supply.—Where generation is by steam power, large coal supplies must be carried in reserve. The New York Edison Company carries always 200,000 tons for emergency. Where water supply is used duplicate pipes should be provided.

Boilers and Steam Piping.—Steam boilers are often arranged in groups, each group being connected to a prime mover. By this plan, any accident to boilers or piping will affect only one unit. In other plants automatic steam valves are used, each boiler being equipped with these valves, which are so arranged that they close when an abnormal pressure drop occurs on either side of the valve.

Prime Movers.—These are less liable to cause trouble than other parts of the system. Sometimes failure of a governor to act will allow the prime mover to wreck itself by excessive speed. On steam turbines and on large engines a centrifugal device is used, which trips a special valve and cuts off the entire steam supply.

Generators.—Subject to breakdown of insulation or breakage of parts. To avoid interruption due to the insulation of one of the generators breaking down, automatic switches are used, operated by rveerse load relays. Overload relays on generator circuits are not practicable. Breakage of parts in generators is usually caused by abnormal strains due to short circuits. Turbo-generators are especially susceptible to these strains, which, however, can be overcome by the ues of reactance coils in the generator leads.

Exciter System.—Storage batteries should be used in connection with this service and the battery kept floating on the field bus-bars.

Main Feeder System.—In large cities by underground three-phase cables. The distribution cable is the weakest point of an electric system. Many troubles due to insulation breakdowns. Service interruption is prevented by various types of relays. In protection of cables one of the prime considerations is the provision for bus-bars. These should be isolated in a separate compartment and carefully insulated. Duplicate sets should be provided. Duplicate feeders should also be provided.

Relays.—There are various types for use under different conditions. Some operate instantaneously under conditions of either overload or reverse load. Others operate after adequate time interval; still others after a variable interval of time depending on the severity of the conditions in the circuit. The complete operation of a relay closes a separate circuit which trips an oil switch in the main circuit. The principle observed in the use of relays is illustrated by a line sketch.

Connection of Main Feeder System.—There are several methods. The high tension windings of the generators or transformers may be connected in star, grounding the neutral point through a resistance. Another connection in general use is the ungrounded system, usually delta connected. The paper discusses the relative advantage of these two systems and describes at length, using diagrams, various methods, with the apparatus used, for the detection of grounds.

Interchange of Power Between Systems.—It is common for large electric generating systems to have connections with adjoining systems for the mutual interchange of power in cases of emergency.

Steam Reserve Plants.—Hydro-electric generators and long distance transmission are subject to frequent interruption and service is being guaranteed by means of steam plants held in reserve. These steam plants also prove valuable for assisting at peak load.

Underground vs. Overhead Distribution.—The greatest single means of protecting distribution circuits is the placing of conductors underground. A blizzard in Baltimore May 4, 1909, carried down practically all the telegraph and telephone circuits and a large part of the electric light and power poles and conductors. The underground system, however, was unaffected and continued operation without any interruption. Combinations of underground and overhead constructions are, from considerations of cost, chiefly used.

Storage Batteries.—These are a protection in case of emergency or act as auxiliary at peak load. The more rapid the discharge rate of a battery the more valuable it is, as emergencies are generally of short duration.

Lightning Protection.—None required for underground systems. The new electrolytic type seems to be superior to others, but is not applicable to outdoor work. Many other types making use of gaps and resistances in various combinations of series and shunt connections are available. The author's company, of Baltimore, are now making extensive comparative tests on various types.

Duplication of Apparatus, Etc.—Practically every part of the central station system should be in duplicate. One of the largest generator units is carried in reserve. Spare parts of the most important apparatus is kept on hand. A machine shop should be provided to make emergency repairs.

Inspection.—Many accidents have been prevented by careful inspection of station apparatus and lines. Periodic inspection should be made.

Operation.—The need of the continual presence of a skilled operator in touch with all conditions of the various parts of the system is pointed out. Many large companies have what is known as "load despatcher." This man has before him a map of the entire system and a record of the loads at the various points reported at short intervals. Any emergency is absolutely controlled by the operator. Orders may be given by electric signals or by telephone.

Discussion.

Mr. Mudge drew attention to the fact that the system described would be possible only in large installations. In the small stations, the great majority, discretion would have to be used. The inapplicability to small stations of various suggestions of the paper was pointed out, among them being the installation of storage batteries and the placing of bus-bars in separate compartments. It was also pointed out that in addition to the precautions mentioned lighting protection by overhead wires was now common practice.

Mr. Leonard Andrews, answering a question as to the reliability of any of the various relay systems, stated that experience in England had proven that many makes of reverse current relays can be depended upon to operate reliably. These, however, should not operate under any direct current or depend on any time factor. No trouble had been experienced with relays in England in recent years and he was surprised at the necessity for such a question in Canada.

The R. C. M. Electric Service Rate System

By S. Bingham Hood.

The early history of rate-making is outlined with the difficulties encountered. With the development of electrical appliances the flat rate became unsatisfactory and the variable rate system began to be developed. Different systems of specialized rate making are explained—the Wright demand system having as its basis a high kilowatt hour rate during peak hours, and a low unit rate at off-peak hours, and the Doherty system, an extension of this.

A Western Delegate—J. D. Peters, Moose Jaw, Sask.

The recent advent of high efficiency lighting units and the consequent extension of residential and street lighting has created a demand for a more equitable scheme of calculating rates. The writer outlines at length a system worked out, by himself, along the lines of the Wright and Doherty plans, which he calls the R. C. M. system, because it is made up chiefly of three factors,—(1) R, which stands for a 'readiness to serve" charge, obtained by dividing the sum of all the annual fixed and operating charges by the total kilowatt generating capacity; (2) C, which stands for "Consumers' Charge" and varies directly with the number of consumers on the system, and (3) M, which stands for "Meter Charge," covering all charges whict vary directly with the k.w.h. output of the system.

The remainder of the paper is taken up chiefly with examples showing the application of this system to various classes of service—residential lighting, commercial lighting, power, etc. The paper is illustrated by numerous diagrams.

Discussion.

Mr. Black thought the paper a valuable contribution to the literature on this subject. The disadvantage, that it is rather complicated to apply.

Mr. Pack.—The paper opens up field of scientific rate making. So complicated that customers may be lost through its operation. Plan might be worked out through a Public Service Commission. The duty of this Association to decide first if the scientific rate is best and then, if they so decide, to commence an educational campaign in its favor.

Mr. Holbrooke thought the plan of selling current scientifically is very proper, but the method of application of measuring the floor area is out of proportion and unfair all round. Better establish a maximum demand in watts and base the charge on the wattage of the customer's maximum demand, limiting or controlling the demand in some way. Mr. Holbrooke quoted from a report of the Massachusetts Commission approving the method of selling current based on the maximum demand, plus a small meter charge.

Mr. Leonard Andrews, speaking of Mr. Littlefield's paper, was surprised to know that the plan here outlined does not find many advocates in America. In England quite as many favor a flat rate basis of charging as any other plan. Mr. Andrews drew attention to another factor in rate-making, which he called "the intensity of demand," now being introduced into England. This means that you should charge a higher rate for lighting current than for current used for heating or cooking simply because there is a greater demand for it.

Mr. Littlefield spoke of the difficulty of applying Mr. Hood's system on account of its complications. Not justifiable to class any business as unprofitable on account of the possibilities involved.

The Residential Lighting Field—How it can be Profitably Cultivated

By A. T. Holbrook.

The field of residential lighting has lain dormant. Less than 10 per cent. of residences use electric lighting. It has not proved profitable for the most part. That it has great possibilities, however, is coming to be recognized by the best men in the industry. The main difficulty lies in the methods of charging for the current. Dissatisfaction with the rates has caused a large number of one time users to discontinue the service.

No question but that residence lighting can be made profitable when the leaks are stopped, the income guaranteed, and the demand limited and controlled. The unsatisfactoriness of existing methods of charging are commented on and the unsuitability of all for residence needs, pointed out. Residence lighting is in a class by itself so far as rate making is concerned.

Some of the Contestants in the Aquatic Events.

The paper then outlines a plan adopted by a Hartford lighting company, which has worked itself out to the satisfaction of consumer and producer alike. This rate is based on a straight per kilowatt controlled demand charge on a yearly basis. The returns have shown a large profit and many other companies are taking up the same system with, so far, similar good results.

This rate is based on a fixed charge of not less than $120 per kilowatt per year of actual station demand. On a monthly basis it is equal to 1 cent per watt per month. Tungsten lamps of standard voltage are used and the current is sold subject to use, without variation of cost, during ordinary lighting hours. This demand is rendered definite by the use of an excess indicator installed for the purpose. The function of this indicator is to serve notice on the customer when he has exceeded his demand and to safeguard the lighting company against unfair treatment on the part of the customer.

Wherever this rate and method of charging is put into effect it appeals at once to that class where the average household income is between $600 and $1,200 per year. This class of customers averages, say, $1.50 per month and ranges from $1 a month up. A house having six rooms with a total of nine 25-watt lamps may contract for four and use up that number for $1.00 a month, where a larger home will be compelled to use eight or nine lamps, out of a total of 20 or 25 installed, at a cost of $2.00 or $2.25 a month.

Recent developments in the manufacture of tungsten lamps has produced the 16 c.p. 20-watt unit, the use of which is strongly recommended in connection with the controlled monthly demand charge. With the 25-watt size only four can be sold for $1, while five of the 20-watt units could be installed for this amount.

Discussion.

The plan of limited maximum demand for the small consumer met with general approval. Mr. Holbrooke explained the construction of the meter used on his check meter system. When the amount used exceeds that for which the instrument is set the meter acts in such a way as to flash the lights. This instrument has no maintenance expense. If the customer wishes to use more light the demand meter is removed by the company for a stated period, a small charge being made.

Notes on Transmission Line Regulation

By P. M. Lincoln.

The importance of the regulation of a transmission line, that is, the voltage drop between generating and receiving apparatus is of first importance. Usually constant voltage is required at the receiving station and the problem to be solved is: what increase in voltage must be supplied at the generating station as the load increases in order that the proper voltage may be delivered at the customers' end. The object of the paper was stated to be a description of a short-cut method of approximating transmission line regulation, for which great exactness was not claimed and which must be used with an appreciation of its limitations.

It was pointed out that with direct current the problem is a simple one in that its solution depends only on the two factors, current and resistance of the transmission lines. With alternating current knowledge of four additional factors is required, leakage, capacity and reactance of the circuit, power factor of the load. It is held that leakage from lines carrying large currents is so small as to be negligible, and further, that capacity effects, except on very long lines, are also very small. The four factors which remain and which must be considered in the line regulation are—current, resistance, reactance, and load power factor.

The effect of these various factors on the problem of line drop is shown graphically, and the fundamental ideas underlying the short-cut method are similarly explained. It is shown that E_g, the generator voltage, is given by the equation

$$E_g=\sqrt{(E\cos\theta+r)^2+(E\sin\theta+x)^2}$$

where $E=$ receiver voltage, $r=$ ohmic drop, $x=$ inductive drop, $\theta=$ angle of lag. From this equation the transmission line drop, E_g-E, is readily obtained.

The short-cut method consists in the simple application of a number of tables which are given. The results obtained from the use of these tables correspond to those obtained from the above formula with the exception of one other small approximation which can only be understood by reference to the diagrams. A simple table is even given by which this small discrepancy may be rectified. The use of the tables is exceedingly simple, and requires no mathematical calculations. They are applicable, by a simple multiplication, to any number of cycles and to copper, aluminum, or any other non-magnetic metal conductor, whose conductivity is known.

The degree of accuracy obtained by this approximation is indicated by a special case comparing the result with that obtained by taking into account, in the first case, resistance and reactance drop, and in the second case, capacity. The approximated method gave 12,690 volts, the second method 12,770 volts, the third method 12,900 volts. The accuracy is considered within the usual error and is amply sufficient for all practical purposes.

Discussion.

Mr. Dion spoke of the value of such a method of line calculation to the average central station operator, with whom mathematical formulae may have fallen into disuse. He spoke of a similar simple unmathematical system recently published by Professor Herdt, who made use of a diagrammatic chart and also drew attention to a still more recent scheme worked out by Mr. A. J. Soper, who uses prepared tables in much the same way, apparently, as Mr. Lincoln.

Prof. Herdt (by letter) drew attention to the fact that the use of tables in this way caused the engineer to lose sight of the underlying principles involved, thus making him a mere machine. The chart, developed originally by Mr. Mershon, possessed the combined advantages of rapid calculation with a constant recognition of the conditions involved. An extension of this chart, to embrace modern conditions, has recently been published by the writer and is explained at considerable length in the letter.

"We are from Montreal"—"Joe" Lachapelle, J. R. Cox and J. A. Fletcher.

How to Increase the Station Load

By S. G. Redway.

It is first pointed out that the old method of waiting for customers to walk into the office with orders is not suited to modern requirements. It is necessary to go after new business. Emphasis is laid on the fact that central stations should make it their aim not only to sell electricity, but also to deliver it in such a way as to satisfy their customers. Unlike most commodities electricity is not shipped at buyers risk, but at the risk of the producer.

The company should endeavor to boom the town, interest the municipal authorities to illuminate the streets, parks and public buildings better, should work in harmony with the wiring and fixture contractors, should promote the erection of electric signs, should endeavor to get motor manufacturers to come into their cities and towns, should call upon the leading manufacturers with a view to substituting steam or gas engines with electric drive, and should interview prospective incoming manufacturers. They should also take an interest in any exhibitions or fairs with a view to handling as much of the lighting and small power business as possible. A permanent showroom should be opened at the company's office, where all the factory and household appliances, which are now a commercial and economic success, can be shown under the direction of a competent demonstrator.

The writer then outlines the organization of a department whose particular duty it would be to see that these ideas are carried into effect. Special printed forms are shown on which reports are made daily and systematically followed up. It is explained that while the scheme, as here defined, applies to a large central station, it is possible to include one or more sub-departments under one head. Above all, system and vigor in the prosecution and following up of new business is the essential.

Discussion.

Mr. Chisholm recognized the value to the larger companies of such a system as here outlined, but did not see how the small central station could make use of it. In small towns the owner was often also office man, advertising agent, and many other things combined. He suggested that possibly a number of neighboring towns may combine and employ a qualified agent who would distribute his time among those towns soliciting business now in one, now in another. In this way they would get the benefit of a competent and reliable man at smaller expense to each station.

Mr. Creed spoke on the necessity of having only good, live, interested men employed, and the equal necessity of cutting all dead wood out.

Mr. Scott spoke of the value of personal interest on the part of the central station engineer. Much missionary work is necessary. Develop the habit of using electric appliances; a customer already using an electric iron, for example, is more easily induced to instal a toaster or heater or other convenience. The field for small motors will also be found very fruitful.

Electric Heating and Cooking Appliances

By Harold S. Brown.

The paper reviews briefly the historical aspect of the subject. In 1827 air was heated by sending a current through platinum wires. The first public demonstration of electric cooking devices was at the Vienna Exposition, in 1883. In very recent years progress has been more rapid.

In the electric heating and cooking field there are many types of heating elements and many ways of encasing and protecting them. For the most part the current is carried by a wire or strip metal conductor. A number of conductor devices is described and it is pointed out that the necessary qualities of the metal are (1) high resistance; (2) slight expansion or contraction with temperature changes; (3) power to resist oxidation.

Domestic Devices.—The more common are outlined, cooking irons, toasters, tea and hot water pots, coffee percolators, chafing dishes, luminous radiators, shaving mugs, curling iron heaters, cigar lighters, etc. The convenience and comfort of these appliances is illustrated. Temperature rise of kitchen with electric cooking not over one-half of one per cent.

Industrial Devices.—Scarcely a factory or warehouse that could not make profitable use of some electrical heating article,—the electric iron, electric glue pot, electric shoe iron, and electric soldering iron are examples.

Medical Devices.—Many devices are manufactured for doctors and dentists that might as well be electrically operated—heating pads, conterizing devices and sterilizers, hot water urns, radiators, dental furnaces and vulcanizers, etc.

Commercial Prospects.—Disadvantages of electric devices are, first cost and operating cost. In the past the instability of heating apparatus was a disadvantage which now, however, is well overcome. The cost of installation is not considered an insurmountable obstacle, by the writer, who believes that an aggressive campaign to demonstrate the advantages and conveniences of electrical contrivances is all that is needed.

Comparative Efficiency of Gas and Electric Heat.

The comparative cost depends on a number of factors: (1) relative price of gas and electric current; (2) relative heat efficiencies of gas and electric apparatus; (3) skill of the operator;

(4) economy practiced. The first two items are discussed at length. Tests have shown that electric heating apparatus is about 75 per cent. efficient and gas appliances about 40 per cent. A table of figures is given representing actual tests made under normal conditions in two kitchens.

The comparative cost of production of a unit of heat, supposing the manufacturing processes of equal cost per pound of coal converted, show an electric unit about four times as expensive to produce as the gas unit. Under actual existing conditions this ratio is more nearly 6 to 1, which in view of the greater efficiency of the electrical appliances becomes about 4 to 1. On this assumption gas at $1.00 a thousand cubic feet corresponds to electric energy at 2½ cents per kilowatt hour.

J. T. Murphy W. Soper H. G. V. Farrer
The Wise Men from the East.

A carefully itemized table of data relative to cost of cooking by electricity is appended. For an average family for one week the consumption is placed at 31 k.w.h.

Discussion.

Mr. Wright thought the manufacturers might co-operate more with the central station men an assist in some way, e.g., by demonstrations, conducted by experts, in bringing these new appliances to the attenion of the customers.

Mr. Fleming suggested that some central station managers might be lacking in enterprise in pushing their own business. The manufacturers were always ready to assist anyone who showed inclination to help himself.

Mr. Simmons had carried on an aggressive campaign in Bracebridge and found a constantly increasing demand for electric service in proportion as the field was worked.

The question of complete electrically-equipped kitchens was discussed. Apparently there are only a few in Canada and these more or less in the experimental stage, but results are proving very satisfactory.

The Attitude of the Central Station Manager Towards Illuminating Engineering

By R. E. Scott.

In this paper some plans of procedure are prescribed which are calculated to be of use to the central station manager who wishes to introduce illuminating engineering methods into his lighting work. The problem of lighting has become a scientific one and although it may be only the larger companies that can afford the services of an illuminating expert on the permanent staff, yet many improvements are easily possible in the old methods of arrangement, which any central station manager with a little knowledge of the subject may himself install.

An illuminating engineer in criticizing or planning a lighting installation will ask himself the following questions:

Is the illumination of the proper intensity? Too strong a light is not only wasteful, but will injure the eyes. A too feeble light also strains the eye muscles. If properly diffused, however, a very high intensity may not be objectionable. The color of the light modifies the effect; for example, low intensity in white light is more satisfactory than high illumination with green light. These examples simply point the complexity of the question of intensity.

Is the light sufficiently diffused? Has all disagreeable and harmful glare been stimulated. This result is sometimes obtained by indirect illumination in which case the room is lighted by reflection only. A proper use of diffusing globes or reflectors is, in other cases, considered to give sufficient dispersion.

Is the light properly distributed? In most installations uniform illumination of desks, tables, etc., is required. The proper height and spacing of lamps requires a knowledge of the photometric curves of the lighting unit. Manufacturers of lamps and scientifically designed reflectors, fortunately, publish such tables.

Is the light of the proper quality? Quality, as here used, means color. This depends on the color of the light as well as the color of the room furnishings. The question of matching colors by artificial light is of great importance. Every improvement in the incandescent light is making it more like true daylight.

Is the light economically produced? Efficiency should be the aim of the engineer just as much in the production of light as in the production of steam or electricity. The central station manager should be at liberty to encourage efficient lighting, and to interfere with the customer who employs two watts to do the work of one. The customer's hesitation to make a change is often the fault of the station's rate system. This should be so arranged as to encourage proper illumination.

Is the installation satisfactory from an artistic point of view? Art and engineering overlap in illumination. Profuse decoration is not art. We should look for harmony and grace in design. To this end the paper suggests that each central station manager should be a member of some organization of illuminating men. The work of the American Illuminating Engineering Society is outlined and its value emphasized.

The author finally draws attention to the question of reputable lamps. It is a fact that the metal filament lamps made by the licensed American manufacturers are superior in performance to those lamps of European manufacture which are imported to this country. An instance is cited of a certain lamp with a white chemical painted on its stem and for which it is claimed that the chemical prevents blackening. This has been shown to be incorrect. It has further been shown that a properly exhausted metal filament lamp (emphasis is laid on proper exhaustion) will not blacken during its rated life. Curves, first of European, second of American lamp tests are shown which go to prove the superiority of the performance of the latter.

An Adams-Fulton Conference.

The Tungsten Lamp a Factor in Modern Street Lighting

By C. L. Stephens.

The fundamental problem is the intensity of illumination required and its production at minimum cost; cost being understood to include expenditure for energy, maintenance charges, interest and depreciation for the lamp, plant, and all auxiliary equipments. The area to be lighted is long and narrow; the result desired is approximately uniform intensity of illumination.

The intensity of illumination is proportional to the light intensity of the unit and inversely proportional to the square of the distance from the light source. Assuming a given minimum of illumination with a certain distance between lights it is evident that doubling the distance between lights will require lamps with 4 times the candle power. It follows also that the energy expended is twice as great. Conversely, if the distance between lights were reduced to one-half, lamps of only on quarter the candle power would be required and the energy expended would just be one-half. Increasing the number of units, however, increases the cost of installation and maintenance, and it will be found in every installation that at a certain point, depending on conditions, the extra cost of installation and maintenance counterbalances the saving in energy consumption.

Mr. Pack soliloquizing before presenting the prize for the "Fish Catch."

Uniform illumination is more necessary in suburban areas even if the intensity is much lower. A ratio between maximum and minimum of 10 to 1 is considered admissable on busy streets, but a ratio of not more than 5 to 1 should be allowed in residential sections. The paper discusses the best positions of lamps for most uniform distribution, and the following conclusions are deduced:

1. The maximum intensity of light should be at between 15 and 20 degrees below the horizontal.

2. The candle power of a single unit should be as low as conditions will permit, i.e., for a given intensity of illumination use a maximum number of small units spaced at frequent intervals.

3. The light should be diffused, that is, so directed that it appears to come from a large source rather than a point.

4. The light should be supported at the maximum height above the illuminated surface, particularly so if it is a large unit and the light is not diffused.

The author proceeds to point out the special adaptability of the tungsten lamps for the kind of illumination here required. The long life of a low voltage tungsten, the white color, the small sizes in which it may be obtained, and the high efficiency are dwelt upon. With such high efficiency also suitable reflectors or diffusers can be used without making the light appear inefficient. A number of figures are here given illustrating reflectors, shades, low voltage tungsten filaments, and a typical curve of light distribution.

The most approved methods of installation are explained at length. Often the 3-wire system is used, by which means part of the lamps, those on one circuit, may be cut out at a certain hour while the remaining lamps may burn longer—all night if desirbale. Regulators of various types also come in for a share of explanation. For the most part constant current regulators are used and a special type of this regulator designed exclusively for use with series tungsten lamps is illustrated and explained. Figures of ornamental street poles carrying from one to five lights are also shown.

Discussion.

In answer to a question by **Mr. Mudge** the author explained that the old regulators would generally work satisfactorily with mixed arc lights and tungstens if the arcs numbered from 20 to 25 per cent. of the total number of units. In some cases it was found more satisfactory to use resistances or reactances instead of regulating transformers. Auto transformers were sometimes used. **Mr. Scott** spoke of the tungsten lamp being a very satisfactory average for street lighting between the old arcs, which are too bright, and the carbons which are too dim for rural sections. He also spoke of the fact of color difference being more noticeable to the casual observer than differences in intensity. An old carbon beside a new carbon shows to very poor advantage when in reality its illuminating power may be almost as great. In tungsten lamps this contrast did not appear with age.

Reports of Committees

A report of the committee on "Uniform Accounting" was presented by Mr. Pack, chairman of that committee. The report states that the committee has carefully examined the classifications ordered by the Public Service Commissions in the States of New York and Wisconsin and has compared these classifications with those adopted by the National Electric Light Association and found them identical. The report states further that the committee feels it is not expedient to suggest any classification involving a radical departure from methods which have already proven successful and has decided to submit to the Canadian Electrical Asosiation the classification of accounts adopted by the N. E. L. A. The committee recommends that the Canadian Electrical Association petition the Ontario Railway & Municipal Board to adopt and to order, a classification of accounts, for municipalities similar to that to be adopted by this Association. The report further adds that the members of the Hydro-electric Commission have so plainly signified their intention of having their accounts and systems thoroughly businesslike that the committee feels sure the Commission will be only too glad to render any assistance in its power in order that the municipalities may carry out a good system of accounting.

A minutely detailed account of the system adopted by the N. E. L. A. is then outlined.

No detailed report on "Central Station Statistics" was presented, but in a general way the results of attempts that had been made to get these statistics from the central station managers were outlined. In many cases no information was available owing to lack of proper reading instruments or careful tabulation of conditions from day to day. In a few cases managers were loath to give information fearing that, in some way, it would be put to improper use. The necessity for an exchange of ideas and statistics among central station operators was emphasized.

The committee on "Installation, Care and Testing of Meters" presented an exceedingly valuable report on this very important phase of electrical work. The report was presented by the chairman, Mr. Webber. The report advised that a standing committee be appointed to deal with this branch of the central station business in order that a yearly report may be made on all questions as to the best department and thus keep the members of the Canadian Electrical Association in touch with any new methods of metering or any new type or improvements of meters which may be brought out.

A good deal has been accomplished if the committee has succeeded in bringing before the members of the Association the necessity for maintaining the efficiency of their meters. It signifies bad management if the meters are allowed to remain in a chronic state of inaccuracy. The members of the Association are specially recommended to make themselves familiar with the Electricity Inspection Act.

Watching the Startling Plays on the Baseball Diamond.

In the discussion that followed the reading of the report the opinion was pretty generally expressed that accurate meters are in the large minority. The system of Government testing also drew forth several expressions of dissatisfaction. For companies somewhat removed from the Government centre the inspection is difficult to obtain and costly. The importance of testing meters, in operation, and right on the customers' line was emphasized. This for the double reason that the consumer had more faith in such a test and also that a meter really may not act the same in the Government's testing laboratory and when carelessly carried and installed on a customer's line.

In connection with the report of the membership committee the question of the affiliation of the Canadian Electric Association with the National Electric Light Association of the United States, was raised. Mr. Black, in moving for the appointment of a committee to look into the matter, stated that sub-sections of the N. E. L. A. were already forming in Canada. The Toronto Electric Light Company had organized one with fifty members. The Montreal Light, Heat & Power Company is forming a section. Mr. Black believed that in a very short time there will be a far greater number in Canada belonging to the N. E. L. A. than to the Canadian Electrical Asociation. Mr. Dion favored the idea. If the Canadian Association could keep both its name and its identity and at the same time reap the advantages of affiliation it might be a good thing. Mr. Frederic Nicholls opposed the scheme. Though, himself a member of the N. E. L. A. and a past-president, he believed that the Canadian Association would lose its identity by affiliation with the larger company. The difficulty already experienced of interesting and reaching the outlying central stations would be increased manifold. A natural sequence would be the disintegration of the Canadian Association. If the C. E. A. was not expanding as it should, and was not as useful as it should be, the reason must be sought elsewhere. Under proper and vigorous management the C. E. A. was destined to become a powerful and independent force in Canadian electrical matters.

The Ball Game

By Special Correspondent

The history of the convention of 1910 would be incomplete without some mention of the Ball Game, which was witnessed by a very large attendance, and was thoroughly enjoyed by all.

The final score
Of ten to four

does not indicate the closeness of the fierce contest, and many thought that if another innings had been played the result might have been reversed. Fears were felt at one time for the safety of Umpire Freeman, of New York, but after the game he was escorted off the field, complimented on his good work and presented with a box of fine cigars. In future, should advise at least an escort across the "line."

In the game of baseball it is necessary before reaching home and scoring a run to first touch third, and this objective point was much coveted, any player getting there being quickly supplaced with the required "energy" to "complete the circuit."

The features were the work of Boyle, who made a single, a double and a three-bagger, and of McDougall, who struck out four times in succession. These incidents demonstrate the proficiency reached by the Canadians in the United States game of Baseball—one showing the strength of the batsman, and the other revealing the cleverness of the pitcher.

The "star" of the game was, unquestionably, Lynch, whose fast handling of long hits and accurate long-distance throwing was a revelation to all except his most intimate friends. Belnap, Foran, Webber and Black also distinguished themselves by timely hits. There was a great deal of talk on the side lines about the "Ops" not having their strongest nine in the field, and it is very evident that next year they will make a determined fight to regain their lost laurels. I should suggest that the "Mafs" organize at once under the leadership of Lynch, who will outline a course of training for all possible candidates—probably a run before breakfast of at least fifteen miles. This is done without any reflection on Capt. Rough, who handled and placed his men in a masterly manner. His unique and commanding appearance was an inspiration at all times, and he never hesitated to replace, with a better player, any man who showed the least signs of having reached third base too often.

The Northern Electric "Rough-ing" it at the Ball Game.

Montreal and Eastern Canada Movements

Inspection Certificates in Montreal—Arbitration in City's Lighting Problem — St. Malon Plant to be Electrified

Movements of the Shawinigan Company.

At a meeting of the shareholders of the Shawinigan Water & Power Company, held recently, the directors were authorized to issue as required additional stock of the company to the amount of $3,000,000. President Aldred of the company stated that in asking for this authority, the directors had no intention at this time of issuing such an amount of stock, but considered it wise for the total issue to be authorized so that the directors could take advantage of favorable conditions from time to time, and use the additional capital to the greatest advantage of the company. It was probable that during the present year the company would issue additional common stock not to exceed $1,000,000.

The announcement was made that an arrangement had been concluded with the Union Bag & Paper Company whereby that company would erect at Three Rivers a pulp mill to be operated by electric power to be furnished by the Shawinigan Company.

Settlement of Inspection Difficulties.

An arrangement of considerable importance has recently been consummated between the eight different operating companies in the Montreal district, whereby further service connections will not be made until a proper inspection certificate issud by the Electrical Department of the Canadian Fire Underwriters' Association is produced.

The announcement of this agreement is particularly welcome to the contracting interests in Montreal, upon whose work it will have a far-reaching effect. For some time past the Electrical Association, Province of Quebec, has been working to effect a reform in this direction, and to obtain a uniform system of inspection. The new agreement will come into force with the beginning of September of this year and we learn from Mr. J. Bennett, chief inspector of the Electrical Department for the Canadian Fire Underwriters that it is the intention to greatly widen the field of inspection in the Montreal district and to aim to eliminate the life hazard as far as possible.

Sherbrooke Railway and Power Company.

The contract for erection of the power house for the Sherbrooke Railway & Power Company was awarded to the Bishop Construction Company, of Montreal, who are already busily engaged with the construction work. The Jenckes Machine Company, Limited, Sherbrooke, are supplying the hydraulic machinery required for this installation, and the Canadian General Electric Company will supply the electrical apparatus. The first development in this project will be about 2,500 h.p. Messrs. Ross & Holgate, of Montreal, are consulting electrical engineers.

Monarch Electric Branch Out.

The Monarch Electric Company, Limited, St. Paul street, will shortly establish a new plant in St. Lambert's, Que. The company propose to erect a factory costing approximately $10,000 and to add quite a number of men to their present staff. The St. Lambert civic authorities have granted the Monarch Company certain exemptions from taxation covering a period of twenty-one years.

St. Malon Plant to be Electrified.

The Quebec Railway, Light & Power Company propose to make considerable changes to their present steam palnt at St. Malon, formerly the station of the Quebec-Jacques Cartier Electric Company, and with this in view have awarded extensive contracts for the supply of electric apparatus to the Canadian General Electric Company, through the Montreal sales-office. These include two 2,000 k.w. step-down transformers, a 20-panel distributing switchboard and high tension equipment for new transformer house. Mr. R. S. Kelsch is consulting engineer for this Quebec power company.

Civic Arbitrators Meet.

Mr. R. G. Black, general superintendent, Toronto Electric Light Company, and Mr. A. A. Dion, manager of the Ottawa Electric Company, were in Montreal during the month in connection with the arbitration of the city's lighting problem. Mr. Black will represent the Montreal Light, Heat and Power Company, Prof. Herdt, the city's interest, while Mr. Dion will be the neutral party. Action in this matter has been postponed by mutual arrangement until July 26th. While in the city the members of the arbitration board were sworn in at the Court House.

Motor Installation at Winnipeg.

The work of installing motors and electric wiring in the new shops which the Dominion Bridge Company are erecting at Winnipeg, is proceeding favorable. Messrs. W. J. O'Leary have the work in hand.

St. Hyacinthe Lighting Plant.

A by-law, authorizing the council to proceed with the installation of a street lighting system, has just been approved by the ratepayers of St. Hyacinthe, Que. The Colonial Engineering Company, Limited, of Montreal, have been appointed engineers for the town, and will install a producer gas engine equipment.

The Montreal Street Railway Company are petitioning the council for permission to extend their service by laying tracks on several new streets.

Messrs. Ross & Holgate have been appointed consulting engineers to design the equipment and to superintend the installation for the Ingersoll Municipal Electric Lighting Station, Ingersoll, Ont.

The Canadian General Electric Company have been awarded the contract for the installation of magnetite arc lamps and equipment for the Saragay Electric Company.

The gathering would not have been complete without Messrs. J. R. Cox and J .C. Hyde, the genial members from the Montreal Light, Heat & Power Company. May this big company be equally well represented at all future conventions.

The management of the Port Hope Electric Light & Power Company, Port Hope, Ont., whose plant suffered so disastrously by fire about two years ago, is contemplating a change from flat rate to meter system, and already preparations are under way to put this plan into execution. Mr. R. A. Corbett is president and manager of this enterprise, and states that his company will make an initial charge of 9 cents per kilowatt hour for light The present installation is a 60 k.w. hydro-electric plant.

The alterations to the new premises of the Canadian Westinghouse Company, Victoria Building, are nearing completion and the offices now present a handsome appearance.

Personals.

Mr. Chas. Porteous, Jr., is now connected with the sales office of the electrical department, Canadian Fairbanks Company, Limited.

Mr. G. C. Knott, of the Benjamin Electric & Manufacturing Company, Chicago, spent a few days in Montreal during July.

Mr. E. G. Mack, representing the Crouse-Hinds Company, Syracuse, N.Y., visited this district recently.

Messrs. R. Edwards, Jr., and H. D. Crouch, with Mr. Turnley, of the Northern Electric & Manufacturing Company, attended the Canadian Electrical Association Convention at the "Royal Muskoka."

Mr. A. D. Blodgett, representing the Blodgett Electric Clock Company, Boston, Mass., was in Montreal recently.

Messrs. Frank Smallpiece and Allan Fletcher were representatives from the local offices of the Canadian General Electric Company to the Muskoka Convention.

Messrs. M. Rubenstein, W. B. Shaw and Clarence Thomson were visitors to Atlantic City recently, representing the Electrical Association, Province of Quebec, at the convention of the National Electrical Contractors' Association. This was held July 20th to 22nd.

Mr. K. L. Aitken, Toronto's city electrical engineer, was in Montreal recently on business in connection with his extensive distribution scheme.

Mr. Irving Smith, wife and little son spent a pleasant three weeks at Kennebunk Beach, Maine, during July.

Mr. W. J. O'Leary was a heavy sufferer in the recent disastrous fire in Campbellton, N.S.

Mr. R. T. MacKeen, manager of the electrical department, Canadian Fairbanks Company, Limited, spent a few days in Charlottetown, P.E.I., during the month.

Electrical Items from Western Canada

Proposed Large Hydro-Electric Installation — Great Building Activity in Vancouver—Stewart Electric Plant in Operation

The coming year will witness a record installation of wireless systems on the Puget Sound, as the result of a recent regulation passed by the United States Government, which orders that all passenger vessels must be equipped with wireless plants on or before July 1st, 1911. The law affects vessels of the Blue Funnel fleet, the Osaka Shosen Kaisha, the Kosmos Hamburg-American line, and the Andrew Weir Australian and Oriental fleets. At the present time the majority of the liners are classed as freight carriers, but as most of them have American licenses to carry 12 or more passengers they will have to install wireless systems. The new law imposes a fine of $5,000 on any vessel, American or otherwise, leaving an American port after the date fixed carrying 50 or more passengers and crew, if not equipped with wireless apparatus. At the present time none of the steamers of the lines mentioned are so fitted.

The Imperial Power Company, Limited, of Vancouver, recently incorporated, proposes to develop a large quantity of power for mining and industrial purposes in Alberni district, Vancouver Island. Water rights on the following streams have been applied for: Spuzzum creek, Boulder creek, Salmon river, Shuzzy creek, Yale creek, Texas creek, Anderson river, Emory creek, Siwash creek, Coquhalla river, Silver creek, Clearwater river, Barrier river, Raft river, Mad river. Other new applications are those of Colin Murray, on China creek; Red Cliff Mining Company on Lydden creek; A. L. Smith, on Canyon creek; and M. F. Smith, on Antler creek.

City Electrician McCrossan has called the attention of Council to the fact that current for the new ornamental lights to be placed on Westminster avenue, Hastings and Granville streets, will cost eight times as much as the present arc lights, in addition to the cost of renewing the three Tungsten globes on each standard yearly. It is likely the city will assume one-eighth of the cost, the balance to be paid by property owners on the local improvement plan. Applications from many residential streets will no doubt be re-considered in view of the excessive cost of the new system.

Vancouver and the city on the banks of the Fraser are steadily approaching nearer to each other, and in a few years will undoubtedly join boundaries. The business relations of the inhabitants of the two cities are now such as to demand a betterment of the half-hourly tram service, and arrangements are being made by the B. C. Electric Railway Company to run cars every fifteen minutes after August 1st. A few years ago a car every two hours was deemed sufficient for the traffic.

The tremendous amount of building in progress in the districts surrounding Vancouver has led to some very hurried wiring up of residences by amateurs, and as a result of protests made by City Electrician McCrossan relative to the danger from fire the B. C. Electric Company has given notice that hereafter its wires will not be connected with residences or plants in the outlying districts until a certificate of inspection is furnished.

The revival in mining in the Kootenay region of British Columbia is creating a market for electric power for the operation of machinery. The West Kootenay Power & Light Company, of Bonnington Falls, has a force of men at work cutting the way for a transmission line from Bonnington Falls to Sheep Creek, it being designed to furnish electric power to the various mines now being worked and others being opened up, including the new stamp mills being installed.

When the Western Canada Power Company's plant at Stave Lake is completed a number of towns and villages in the Fraser Valley will have their lighting and power problems solved most satisfactorily. Already the towns of Haney and Hammond are negotiating with the company, and it is likely that a transmission line from the plant to Pitt River will shortly be commenced. The company also intend to put in light and power to Mission City this year, the line serving a number of intermediate points.

The British Columbia Electric Railway is placing new pay-as-you-enter cars on the Victoria system. The cars have entrances at both ends, and are double truckers. They are equipped with the latest pattern of improved street car fenders manufactured in the company's shops at Vancouver.

On his retirement from the position of manager of the British Columbia Railway Company at New Westminster, Mr. J. D. McQuarrie was made the recipient of an address, a handsome leather upholstered arm chair and a silver table service, suitably engraved, as an evidence of the esteem entertained for him by the New Westminster employees of the company.

The growth of Vancouver's suburbs is well illustrated by the fact that over 100 additional arc lamps will be installed September 1st on new streets.

The laying of the new C. P. R. cable between Departure Bay, Vancouver Island, and the mainland near Vancouver, was successfully accomplished by the steamer Restorer between 6.50 a.m. and 1.30 p.m., 32 miles being paid out without a hitch.

The Stewart Water, Power & Light Company has put in a complete installation of electric light in that busy mining town. The switching on of the current for the first time was made the occasion for great festivities and a ball was given, at which Mr. G. K. Williams, of the firm of Macdonald & Williams, Vancouver, was the host as engineer in charge of the installation.

Although the Provincial Government recently turned down an application for power development rights at Campbell river, on Vancouver Island, the Pacific Province Power Company is now trying its luck. The site of the proposed hydro-electric power plant is at the lower end of Campbell Lake, and the plan includes the erection of a dam which will raise the level of one of the adjoining lakes from 25 to 50 feet, the water being then conveyed by flume to the power house at the mouth of the Quinsam river, a branch of the Campbell.

The New Westminster tram line of the British Columbia Electric Railway will, in the near future, be extended to Fraser River Mills, a distance of about one and one-half miles from the present terminus at Sapperton. A branch will also be constructed on Lulu Island to serve the industries being located there.

Assistant Manager Glover, of the British Columbia Electric Railway, recently informed the Vancouver City Council that it was the intention of the company in the near future to place an improved fender on all its cars operating over the city lines. The fenders are being turned out at the company's shops at New Westminster.

Seattle will shortly possess the highest powered wireless telegraph and telephone station in the world. It is the plan of the North American Wireless Corporation to inaugurate a trans-pacific service at an early date, and the Seattle station will be used to communicate with Alaska and the Phillipines.

During the first six months of the year the B. C. Electric Railway Company carried on its Victoria lines a total of 2,482,043 passengers, an increase of 192,550 over the corresponding period last year, when the total was 2,289,493. The increase this year was 9 per cent.

Messrs. Heffner & Bowness, of the Vancouver office of C. B. Smith & Company, hydraulic engineers, of Toronto, recently inspected the water power at Adams River, B.C. It is whispered that a big development scheme is being worked out, to include land irrigation and the construction of electric railways.

Vancouver capitalists have submitted to Nanaimo citizens a proposition to establish a city and suburban street car service. The matter is being taken up by a citizens' league.

Mr. James Wilson, superintendent of the C. P. R. telegraphs at Vancouver for many years, retired under superannuation rules at the end of June owing to ill-health, after 30 years' service in British Columbia. He is succeeded by Mr. Jas. Fletcher, for twenty years chief operator and circuit manager of the system at Vancouver.

Colin Murray, a wealthy Seattle man, proposes to develop electricity on China Creek, in the vicinity of Port Alberni, Vancouver Island, in order to supply power to the mines now being developed in that region.

A. E. Waterhouse, of Seattle, has applied for a water record on the Sproat river of 500 inches, his intention being to erect a power plant to furnish electricity to Port Alberni, the new "boom" town on Vancouver Island to be tapped by the Canadian Northern Railway.

Work has been started by the British Columbia Electric Railway on their handsome new interurban station at New Westminster. The building will cost about $100,000.

The second unit of Nelson's civic power plant is now in successful operation. The entire plant cost $300,000.

The B. C. Electric Company is making rapid progress on the new plant being installed at Jordan River, Vancouver Island. Nearly 500 men are at work. The company's promise that power would be available for use at Christmas may be fulfilled if no delay takes place in the arrival of the machinery.

The British Columbia Telephone Company's men are now stringing an additional copper wire between Victoria and Nanaimo. This will give three circuits between the two cities.

The New Westminster Trust & Safe Deposit Company has taken over the stock of the Okanagan Telephone Company, which now serves Vernon, Armstrong, Enderby and the Coldstream estate. The capital stock of the old company was $100,000, and this will be largely increased.

The installation of Vancouver's new ornamental lighting system is now in the hands of E. A. Earle & Company and the Electrical Construction Company. The former concern will establish the new system on Hastings street and Westminster avenue; the latter on Granville street.

Mr. B. Jenkins, general superintendent of C. P. R. telegraphs, western lines, reached Vancouver by motor car July 7th on a trip of inspection. He was accompanied from Field to the Coast by Mr. John Fletcher, superintendent of telegraphs for British Columbia, and Mr. Frank E. Camp, the head of the telephone department.

A contract for electric lighting was recently signed between the British Columbia Electric Railway Company and the municipality of Point Grey, one of Vancouver's most progressive suburbs. Alternating inclosed arc lights are called for, and a first instalment of fifty lamps is to be in operation within the next three or four months.

The Council of Ladysmith, B.C., has agreed to supply electric light to users beyond the city limits at one per cent. per watt above the charge to city consumers.

Magnetic arc lights are being installed in Victoria. About fifty of these lights will be installed every year until the entire city is deluged with light.

Mr. Wynn Meredith, of San Francisco, consulting engineer in charge of the Jordan River power development plant of the British Columbia Electric Railway, recently made an inspection of the work and expressed satisfaction with the progress being made. Mr. E. E. Carpenter is resident engineer, with offices in Victoria, Mr. A. B. Carey overseeing the work on the ground.

It has been decided to improve the Dominion Government telegraph and telephone system through the islands in the north of the Gulf of Georgia, connecting with Victoria and other points on Vancouver Island. The projected extensions embrace 59 miles of land wire and 82,050 feet of cable. The line will tap Campbell river, Quathiaska Cove, Heriot Bay (Valdez Island), Sutil Channel, Mary Island, Cortez Island, Sarah point and Lund.

Nanaimo Light, Heat and Power Plant

Up-to-Date Installation—Steam Power Auxiliary—Storage Capacity of Half a Billion Gallons—Capacity can be Doubled

The electric plant of this company, situated at Nanaimo, Vancouver Island, presents several interesting features in its electrical equipment. The plant is situated on the banks of the Millstone river, from which the greater quantity of the power is taken. The flow of water in the river is comparatively swift and varies within wide limits during the different seasons of the year. The company, incorporated in 1895, has, year by year, added to its plant, until to-day it gives Nanaimo a lighting system second to none on the Pacific coast. In the construction of the new power house on the banks of the Millstone river, and since that time, the company has expended many thousands of dollars in an effort to meet all demands, and at the present time the management is looking forward to the very near future when the city will have an abundance of electric power sufficient to provide light and power the full 24 hours of the day, and heat for domestic use, such as ironing, etc.

In the power house, a corrugated iron structure, 48 x 70 feet, is installed a plant capable of developing 500 h.p. by waterwheel, and a steam auxiliary of 175 h.p. Four Canadian General Electric generators are in use with a combined capacity of 325 k.w., to which will be added, in the near future, a Canadian General Electric 250 k.w., 3-phase generator.

The water power which is now used by the company, is obtained at a point about a quarter of a mile from the Quarter Way House, where a dam, as shown in Fig. 1, is constructed, the dam being 150 feet long, 14 feet high and 12 feet wide. From this dam runs a ditch 725 feet, and thence a flume 2,000 feet long conveys the water to a tank measuring 12 x 14 x 26 feet. From this tank a 30-inch pipe conducts the water 1,800 feet further, thence a 26-inch pipe, 400 feet long, carries it to the power house. This latter pipe, which is of the new wooden wire-banded type, connects with a metallic receiver of three branches, each with a 24-inch gate valve. From these branches the water strikes three waterwheels, each 48 inches in diameter, two delivery nozzles to each wheel, while to modify or increase the dam at an expenditure of $20,000, with a capacity of 90,000,000 flow there is a deflector that opens or closes the nozzles as required, the machinery being very simple and easily handled. The motor wheels are set on solid concrete foundations. The two fly-wheels, which are 8 feet in diameter, 22-inch face, were manufactured by the Albion Iron Works, of Vancouver, but all the other castings, etc., were manufactured by the Nanaimo Foundry, T. Debeson & Sons, proprietors.

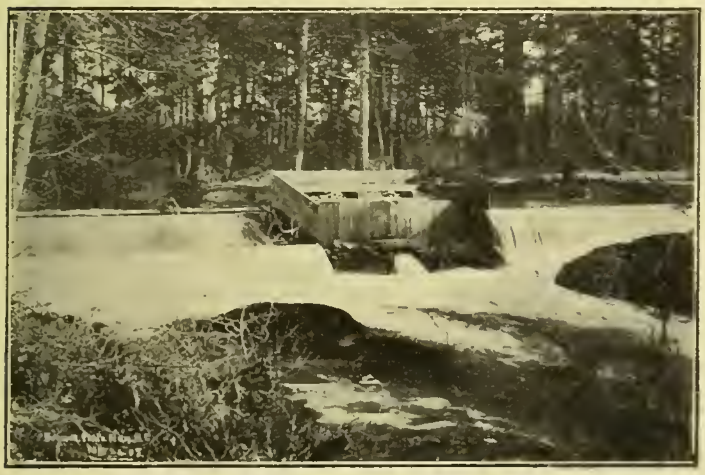


Fig 1—Birds Eye View of Nanaimo Storage Dam

The river carries water nine months during the year in sufficient quantities to operate the plant, but in order to have a sufficient supply on hand throughout the remaining three months, the company purchased a strip of land in Mountain district, some four miles from the power house, on which it has constructed a cubic feet, or over 500,000,000 gallons. This amount of water will be sufficient to meet all demands for some time to come, and later, should more power be needed, the company could, by constructing another power house in the vicinity of the Millstone dam, double its capacity by using the water a second time.

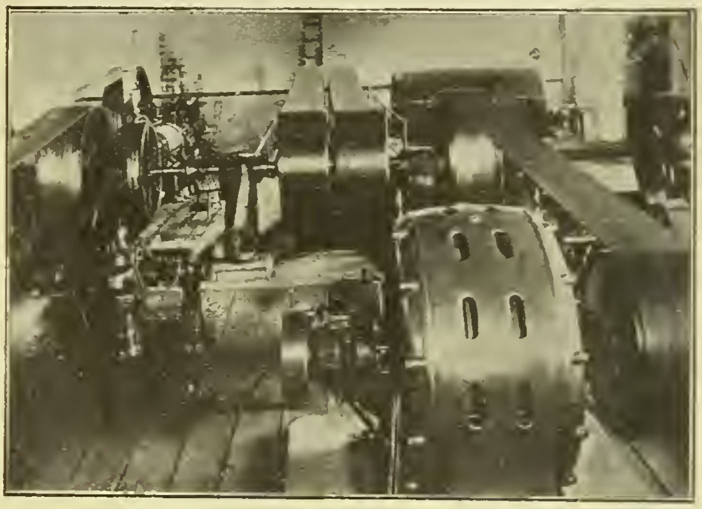


Fig 2—Generating Station of the Nanaimo Electric Light, Power and Heating Company, Vancouver Island

The street lighting of the city is provided by this company, the number of arc lights used for this purpose last year being 62, with 40 incandescent lights, each of 32-candle power, the cost to the city for 1909 being $4,000.

In the near future ten more arc lights will be installed, and it is now the intention, possibly before the end of the year, to install enclosed arc lights throughout the city, which, it is believed, will give a better diffused light than the arcs now in use.

Development at Farnham, Quebec

Farnham, Que., is at present interested in the proposed extensive development of electrical power on the Yamaska river. A short time ago the ratepayers authorized the expenditure of $100,000 for local improvments, including an extension of the municipal electric plant.

Messrs. Ross & Holgate, consulting electrical engineers, were retained in the corporation's interests and have prepared a preliminary report covering the possibilities of the Yamaska river for development of electrical power.

A head of approximately 27 feet is available and it is estimated that between 800 and 1,000 horse power can be obtained. The Farnham council are preparing a campaign to bring power users to the town and inducements of cheap power will be held out to manufacturers.

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Telephone Progress

Telephones in England—The Government Absorbing the National—British Attitude Towards Municipal Operation

In view of the transfer of the National Telephone Company's system to the Post Office or Government control next year, the administration and methods of charging for telephone service are now matters of great importance to the British people and are being discussed vigorously by the National and other Chambers of Trade, which are issuing circulars, periodically, containing the subject matter of the deliberations of these bodies on telephone questions.

A strong movement is on foot in support of municipal control of local telephone systems with government operation of the long distance lines. The town of Hull, having tried the experiment of local control and having succeeded in operating its system to the satisfaction of its customers, in addition to showing a handsome surplus, is being quoted as exemplary of what other municipalities can do. In the Hull system the entire cost was approximately $300,000. Last year's profit after payment of interest, sinking fund and all charges, was $5,850. There is a sinking fund of $60,000 or one-fifth of capital cost. And, finally, the yearly charge to the subscriber is only one-half that in other towns similarly situated.

Among the reasons advanced in favor of municipal administration are the following:

(1) Telephony is mainly a local business; 98 per cent. of all telephone messages are local in character.

(2) Because the cost of working local exchanges increases with the size of the exchange; in Germany the charges are graded largely on this basis.

(3) Past experience confirms that municipal management will be more economical, accessible and efficient.

(4) Because the fact of the way-leaves, etc., being in the hands of the local authorities, would make both for convenience and economy.

(5) Because towns of similar size would be a check on each others management.

(6) Because it is not good policy to increase more than is necessary the already large number of post office employees.

(7) In the supply of ordinary commodities, competition fixes the rate, but in the supply of public service a reasonable rate can only be decided by comparing the charges of similar localities, which, in the hands of the state, could not possibly be brought about.

A recent issue of the National Chamber of Trade, after quoting the above arguments in favor of municipal control, concludes with the following definite statement: "It is impossible to go through the lengthy proofs that have led to unanimity with respect to municipal administration after 1911. The above, however, contribute some of the main conclusions from which we have every confidence in asserting "that there will be no reasonable rates in this country if the local business of telephony is committed to the hands of the state instead of to the authorities who understand the needs of their own areas and who are the natural repositories for the control of local inter-communication."

In view of the rapid growth and pretty general success of the independent telephone movement in America, and in view of the oft-repeated policy of the Canadian Independent Telephone Association favoring government ownership of the long distance systems, the English movement along almost exactly similar lines is of keen interest, and is decidedly important as corroboration that the Canadian Independent scheme is sane and reasonable.

Manitoba Telephones Once More — Expensive Installation—Costly Operation—Comparisons With Other Cities

The Conservative victory in Manitoba is made the occasion, on the part of one of our daily contemporaries, of a reference to that unfortunate telephone transaction as the cause of the triumph of the Roblin Goverment. While it is far from being our wish to deprive any member of this government of any honors he may have achieved in that inglorious encounter with the Bell Telephone Company, it is only right in the interests of other provinces that may now or at any time in the future contemplate similar action in connection with their telephone system, that the facts should be placed clearly and correctly before our readers that they may judge for themselves whether they care to have elections won by so enormous a depletion of the provincial treasury.

In our issue of April, commenting on the then recently published report of the Manitoba Telephone Commisioners for 1909, it was shown that though there was a nominal net revenue of $296,000, this did not include interest on debentures or sinking fund, which would reduce the surplus to $44,000, nor did it include a moderate allowance for depreciation which would convert this small surplus into a substantial deficit of about $200,000.

The recent receipt of the latest financial report of the town of Hull (England), which operates its telephone municipally, has been made the basis of a set of comparisons between a number of well known systems, and the following figures will be of interest and are decidedly instructive.

Capital Expenditure Per Telephone.

Hull (Eng.), Municipal. No toll lines	$ 99.76
Grand Rapids (Mich.), Independent. 4,785 miles of toll lines	119.00
Bell Telephone Co. of Canada, 32,217 miles of toll lines (See proceedings Select Committee on Telephones, 1905)	141.00
Chicago Telephone Co., all expensive city construction.	141.00
National Telephone Co. (Eng.), all expensive city construction	153.00
Manitoba Government, 5,180 miles toll lines	238.45

Cost of Operating per Station.

Hull, no toll lines	$11.43
Grand Rapids, including toll lines	13.78
National Telephone Co., (Eng.), no toll lines	17.51
Manitoba Government, including toll lines	21.52

Capital Invested and Number of Telephones.

	Capital.	No. 'phones.
Grand Rapids	$3,321,530	27,855
Manitoba Government	5,102,978	21,400
Bell Telephone Co. of Canada (1905)	9,916,960	70,000

It is further worthy of note in this connection that the capitalization of the Post Office Telephone System in London, Eng., probably the most expensive installation in the world, works out at $255 per 'phone, only a small fraction in excess of Manitoba's figure of $238. As stated above, the conditions are not such as cause us any pleasure in their contemplation, but they are, nevertheless, true and it is due to other Canadian provinces to represent in their true light, facts which may at some future date have an important bearing on their telephone policy.

The British Columbia Telephone Company will expend an enormous sum of money in the near future in placing its wires in Vancouver and Victoria underground. The appearance of the streets will be vastly enhanced.

Current News and Notes

Berlin, Ont.

Construction work on the People's Railway was begun here a few days ago.

Blyth, Ont.

Tenders for line materials and erection of telephone lines for the Blyth Telephone System will be called shortly. Full information can be secured from the secretary, Mr. A. Elder, this place.

Brandon, Man.

The Brandon Electric Light Company let the contract for the laying of the mains for the big plant which is to furnish steam heating to the business portion of Brandon from the central station to A. E. Bullock.

Barrie, Ont.

An agreement has been reached between the town council and the Monarch Railway Company, giving the latter a 25-year franchise non-exclusive. The work to commence not later than November 1st, 1911, and to be completed in one year. A by-law to this effect will be submitted.

Chatham, Ont.

The Chatham Gas Company has increased its rates. Mayor Austin has obtained favorable reports from Hon. Adam Beck as to the price at which Niagara current can be delivered, who mentions 4 cents per k.w.h. as a possibility.

Calgary, Alta.

The new branch of the street railway, for which estimates have been passed by the commissioners, will cost over $250,000.

The ratepayers will vote on a by-law on July 20th to raise $125,000 for the purpose of constructing, erecting and equipping a municipal electric power paint.

Edmonton, Alta.

The bylaws to grant franchise to radial railway and franchise for Pintsch gas plant were carried.

The Board of Commissioners have made an offer to Mr. M. W. Eager, acting for the Edmonton Heat & Power Company, of $20 per horsepower per annum for power.

City Engineer Latournel submitted the detailed plans for the east end extension of the street railways. Tenders will be called for immediately and construction begun as soon as possible.

Edmondville, Ont.

The Tuckersmith Municipal Telephone System are calling for tenders for line material and construction of telephone lines. Plans and specifications may be seen at Mr. Thomas G. Shillinglaw's residence, Edmondville, or at the office of the engineer, George J. Beattie, 109 Victoria street, Toronto.

Fort William, Ont.

The Ontario Railway & Municipal Board has inspected the five miles of the Mount MacKay & Kakabeka Falls Railway practically completed and issued a temporary order allowing the operation of cars over the line.

Grand Falls, N.B.

It is announced that arrangements have been completed between the Grand Falls Power Company and Sir Wm. Van Horne and other owners of property by which the latter will take over the old company and develop power at the falls.

Ingersoll, Ont.

Mr. Ross, of the firm of Ross and Holgate, Montreal, has been engaged to prepare plans, get tenders, and generally supervise the recently-acquired plant of the Ingersoll Electric Power and Light Company.

Kamloops, B.C.

An electric railway from Kamloops to Vernon is proposed. Water powers in the vicinity could be developed for its operation.

Kingston, Ont.

The Seymour Power & Electric Company has made an offer to supply up to 3,000 horse power, or more if required, for $25 per h.p. It is proposed that the company handle orders of 25 h.p. or over, and that the city attend to the distribution of the smaller orders.

Kenora, Ont.

It is stated that the Reese Engineering Cimpany have acquired the Keewatin Power Company's power and property. The intention is to supply several Manitoba municipalities, of which it is stated Brandon has accepted an offer equivalent to 2,500 h.p. at $20 per h.p. Date fixed for delivery, December, 1911.

Lethbridge, Alta.

Connection by long distance telephone between Wainwright and Lethbridge, extreme points in Alberta, will be established this year by the telephone department of the provincial government.

London, Ont.

Power Solicitor Dark, of the city distribution system, is authority for the statement that a rate of 1.56 cents per k.w.h. will be quoted power users.

The cost of the transmission line to Springbank is estimated by City Electrician Roberts at slightly less than $10,000.

A contract was let for the laying of 90 miles of 12-inch gas pipes from Raleigh township near Rondeau to this city.

The Water Commissioners awarded the contract to the London Foundry Company for 76 ornamental electric light poles at $29 each. The Northern Electric Company, of Toronto, were given the contract for line hardware, amounting to $1,700.

Montreal, Que.

The city council has decided to install a system of underground conduit for all its overhead wires.

Messrs. Ross and Greig have been awarded the contract for the installation of four tandem compound Goldie and McCullough engines in the Chateau Laurier, Ottawa.

Paris time was transmitted some days ago from the Eiffel Tower by wireless telegraph to all wireless apparatus within a radius of 2,500 and 3,000 miles. The time signals are to be continued and will be sent at midnight, and again at two minutes and four minutes after. The receipt of a signal will not enable a ship to determine its position or even its longitude, but will serve as a check on the chronometer.

On the ground that she and her three children are completely destitute, Madame Marie S. Bernier has entered suit in the Superior Court, through Mr. P. E. Leblanc against the Light, Heat & Power Company. She claims $10,000 damages. The action dates back to an accident caused by a live wire at Chambly in November of last year, when the husband of the plaintiff and Louis Carieux were killed, and Adelard Robert and Louis Larocque injured. All four men were stringing a wire across the canal at Chambly to Montreal. Bernier was at the reel. Owing to negligence, it is contended by the plaintiff, the wire was allowed to come into contact with one of the high power lines above, and the four men received shocks, two of their number being killed.

Moose Jaw, Sask.

The bylaw to expend $35,000 on extension of lighting system, was carried.

John Bocrae, consulting engineer, and Hector A. Dion, assistant engineer, Ottawa, Ont., will supervise the construction of the new electric street railway now being built. Noted previously.

Moncton, N.B.

The Moncton Tramways, Electricity & Gas Company, Limited, which have been granted a charter, will take over the present electric light plant, and early in 1911 will commence operations, supplying the town with gas as well as electricity. They will also operate an electric car service in the town of Moncton and to suburban points.

Nanaimo, B.C.

The Dominion Stock & Bond Corporation, Vancouver, have offered to construct and operate a suburban street car line, the city guaranteeing the interest on the bonds. Invested capital about $400,000. G. H. Salmon, manager.

Nelson, B.C.

The $31,000 contract for the second unit of the city's power plant at Upper Bonnington has been accepted. E. M. Breed is district manager for British Columbia, of the Allis-Chalmers-Bullock Company, the engineering company that built and installed the two units for the city.

Niagara Falls, Ont.

The new pipe line for the conveyance of water to develop an additional 75,000 horse power for the Ontario Power Company was completed on July 20th. The pipe is of reinforced concrete, and approximately 18 feet in diameter. The necessary power house extension and electrical hydraulic installations will be vigorously prosecuted.

Ottawa, Ont.

The Ottawa Electric Railway announces that in future it will build cars of greater length and only the pay-as-you-enter type.

The Department of Labor appointed a Board of Investigation to inquire into differences between the C. P. R. and its commercial telegraphers. The company is represented by Mr. F. H. McGuigan, and the telegraphers by Mr. D. Campbell.

Mr. F. D. Monk, M.P., chairman of the Water Powers Committee of the Conservative Commission, has been conferring recently with the Hon. Clifford Sifton regarding the proposed inventory, and classification of all the Water Powers of the Dominion developed and undeveloped. The work, for which a grant was made last session, is now under way.

Prince Rupert, B.C.

An electric light plant to cost $70,000 has been recommended. V. W. Smith, chairman of committee.

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Prince Albert, Sask.

Goldie & McCulloch, of Galt, Ontario, obtained the contract for boilers for the electric light works.

Quebec, Que.

Before the adjournment of the Public Utilities Commission recently a meeting was held behind closed doors at which it is understood the chairman, Lieut.-Colonel Hibbard, drew the attention of the Commission to the number of serious accidents which had occurred recently upon the urban and suburban electric railways in Montreal, numbering in all some sixteen within the last five months. Mr. Laberge, a member of the Commission, was asked to investigate and prepare a statement of each of these accidents that had occurred since the formation of the Commission. The latter expressed the intention of taking active precautions for safeguarding the public from accidents of a similar kind in future.

Sherbrooke, Que.

Preliminary work has begun at the site of the street railway's new power house.

Stettler, Alta.

This municipality is to install an electric light plant of which, it is stated, the John Galt Engineering Company have charge.

St. Catharines, Ont.

By-laws, giving the Buffalo, Niagara and Toronto Railway Company, and the Ontario Power Company rights over city streets, will be voted upon July 29th.

The local electric light company has engaged experts who will visit and discuss with the consumers the advantages, methods of economizing, etc., of electric service.

Seaforth, Ont.

The ratepayers on August 8 will vote on Hydro-Electric by-law for $25,000, to cover cost of power plant, and equipment for street and general lighting.

The town council has decided to submit a bylaw to the people for the purpose of purchasing 400 horsepower electric current from the hydro-electric commission.

The contract for the large street transformers was awarded to the Packard Electric Company, of St. Catharines, and for the small transformers to the Westinghouse Company, of Hamilton.

Strathcona, Alta.

The municipality of Leduc has asked this city to supply electric light and current for power purposes. Ald. Richards, chairman of Fire and Light Committee.

A by-law was submitted on July 20th to provide for the raising of $10,000 for the extension of the city's electric light and power system.

Stratford, Ont.

The Council of Waterloo Township has decided to submit to the ratepayers a bylaw to take a $10,000 block of stock in the People's Railway Company on August 8th.

On July 29th two by-laws will be submitted to the ratepayers; the first to grant a franchise to the Stratford Railway Company; the other to purchase the gas company's electric plant by an annual payment of $1,380 for 10 years.

The Light & Power Commission will purchase 800 lamp reflectors from John Forman, Montreal, for use on the street lights. The lamps will be placed from 14 to 16 feet above the ground and from 100 to 300 feet apart, depending on locality. 75-watt tungstens have been chosen for this installation.

Toronto, Ont.

The Board of Arbitration to consider the points at issue between the Toronto Street Railway Company and its employees, are J. P. Mullarkey, for the company, J. G. O'Donaghue for the men, and Judge Banon as chairman.

The contract for supply of aluminium wire per pound was awarded to Messrs. Parke & Leith, Toronto, at 22 cents per pound.

J. M. Dixon, Edmonton, and S. M. Coulter, Toronto, have entered suit against W. G. Trethewey, Toronto, to recover $176,000 for breach of contract. The suit arises out of the failure of Trethewey to give plaintiffs a share in Northwest lands in return for securing street railway franchise in Edmonton for Trethewey.

Electrical Engineer Aitken will visit Boston with the view to obtaining pointers in that city on street lighting. This was decided upon at the suggestion of Mr. A. Dow, Detroit, the expert electric adviser of that city.

Victoria, B.C.

The by-law calling for the expenditure of some $75,000, to allow of the B. C. Electric Railway Company laying its wires underground, will shortly be submitted to the ratepayers.

Tenders for the cluster light standards and lights will be called for.

Vancouver, B.C.

The contract for installation of the ornamental lighting system on Granville street has been awarded to the Electrical Construction Company.

At the request of the employees of the B. C. E. R. the plan of profit sharing has been eliminated. The new rate for motormen and conductors ranges from 22 cents per hour for beginners to 35 cents per hour for 5-year men.

A verdict of $11,000 has been awarded against the B. C. E. R. in favor of the widow and infant child of J. Wilkinson, one of the victims of the Lakeview disaster.

The B. C. Electric Railway Company is now installing an electric clock system throughout the city. Many of the banks and leading business houses are taking the service.

The B. C. E. R. Company has forwarded to the city treasurer its cheque for $3,915.94, this being the city's percentage on the business done over the lines within the limits during the month of June, according to the consolidated tram agreement. The amount for the corresponding month last year was $2,903.20. For the first half of the present year the total of the tram company's percentage payments in $15,955.10. This representes an advance of 50 per cent. on the total of $10,636.04, the payments for the corresponding period last year.

Plans have been announced by the Vancouver Power Company, a subsidiary organization of the British Columbia Electric Railway Company, which contemplate the development of 100,000 horse power of electrical energy. To fully develop the two sources of power the B. C. Electric Railway Company will expend ten million dollars. The company has several engineering companies now in the field near the new sources of water power, and state that it is possible operations on the new plants will be started during the present season. Additions to the equipment will be installed as necessities demand.

Windsor, Ont.

The ratepayers decided to grant franchise to the Electric Distributing Company to bring Niagara power into Windsor.

Because the contract of Geo. P. Thomas, of Windsor, electrical engineer, was not passed upon by the shareholders, Mr. Justice Sutherland holds that the contract was not valid and dismisses his action to recover $5,500 damages from the Windsor & Tecumseh Railway for breach of contract.

Welland, Ont.

The by-law to grant franchise to electric railway through the town was carried; that for electric fire alarm defeated.

Winnipeg, Man.

Permit was issued to city for power sub-station, corner of Hilock and McPhillips streets, $11,400.

The city is advertising for a business man to manage the sale of power.

Tenders addressed to the Chairman of Board of Control will be received until September 1st for the manufacture, delivery and installation of 46,000 feet of 13,000 volt, three-core cable. Copies of specifications obtained at the power engineer's office, this city, and also at offices of Messrs. Smith, Kerry & Chace, Toronto. M. Peterson, secretary.

Yorkton, Sask.

The Town Council passed a resolution authorizing the preparation of a by-law to expend $35,000 on a municipal electric light plant.

Condensed Department

Advertisements in this department will be charged at the rate of 15 cents per agate line (14 agate lines make one inch) per insertion.

Advertisers who do not wish their names disclosed may use an Electrical News Box number without extra charge.

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One 50 h. p. Electric Motor, 60 Cycle, 2 Phase, 2080 volts. Must be in good repair Address MUSKOKA LEATHER CO., Bracebridge, Ontario. 8

Position as Foreman

Electrician wants position as foreman. Have over eleven years experience, installing lighting plants and all classes of electric wiring for Motors, Lighting, Bell Systems and Telephones. Will be open for employment Sept. 15th. Box 117, ELECTRICAL NEWS, TORONTO.

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Smart Agent wanted to sell first-class line and carbons in Toronto, Winnipeg or Calgary. Splendid opportunity for young man with knowledge of lamps and willing to devote either part or whole time. Apply Box 111 ELECTRICAL NEWS, Toronto, Ont.

Canadian Agents Wanted

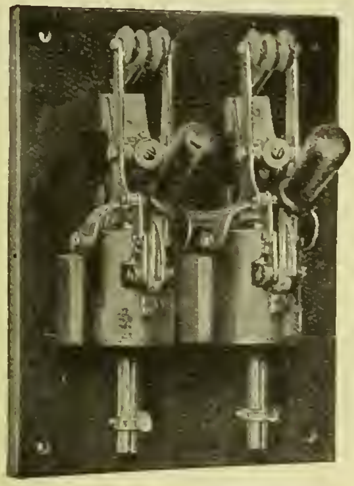
Leading firm of British telephone manufacturers are open to appoint sole purchasing agent for Montreal and Toronto. Only first-class, well established firms capable of buying large quantities of telephone apparatus, electric bells, etc., need apply. "Telephone" care of GORDEN & GOTCH, St. Bride Street, London Eng. 8

Patent Notice

Anyone desiring to obtain the Metal Separator covered by Canadian patent No. 113965 granted on September 8th 1908, to Richard Middleton Simpson, of Wellington New, Zealand, may do so upon applicaation to the undersigned, who are prepared to supply all reasonable demands on the part of the public for the invention, and from whom all information can be obtained. Fetherstonhaugh & Co., 5 Elgin St., Ottawa, Russel S Smart, resident. 8

Patent Notice

Anyone desiring to make use of the System covered by Canadian patent No. 112635, granted to John S. Highfield, on June 23rd, 1908, for Electrical Distribution may do so upon application to Messers. Chapman & Walker, of 69 Victoria St., Toronto, who are the agents of the patentee in Canada. Further information may be obtained from the undersigned. Fetherstonhaugh & Co., 5 Elgin St., Ottawa, Canada, Russel S. Smart, resident. 8



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Worcester, Mass., U. S. A.

Recent Canadian Patents

125735, Chas. L. Chisholm, Marysville, N.B., Telephone Receivers.—In the above named the diaphragm is mounted on a ring shaped support firmly cemented to its periphery, this ring being clamped between the body of the receiver and the removable cap at the hearing end of the receiver. Another improvement is the use of an electro-magnet whose pole pieces terminate in curved ends adjacent to the diaphragm. By the latter means the inventor claims to be able to cause the more delicate sounds to be faithfully reproduced.

126,110—Wm. Dredge Fleet, Copper Cliff, Ont.: electric water heaters and automatic controlling devices therefor. International Nickel Company.

The water in the heating tank circulates in co-operation with the water in the storage cistern, the matter being provided with a cold water inlet and hot water outlet. In the heating tank is secured a heating coil through which the current passes. The switch regulating this current is automatically operated by a thermostat so that when a certain temperature is reached the current is turned off.

Mr. W. R. Reynolds, who for the last three years has been manager of the electric light and waterworks system of St. Marys, has been appointed manager of Ingersoll's electric system.

The I. P. Morris Company, of Philadelphia, have under consruction, for the plant of the Michoacan Power Company, of Noriega, Mexico, two hydraulic reaction turbines, which are to deliver 6,000 h.p. each when running at a speed of 514 revolutions per minute, and under an effective head of 670 feet. When both units are delivering full power they will require slightly less than 200 cubic feet of water per second, which will be delivered through a single penstock over a mile in length.

MOONLIGHT SCHEDULE FOR AUGUST

(Courtesy of the National Carbon Company, Cleveland, Ohio.

Date.	Light.	Date.	Extinguish.	No. of Hours
Aug. 1	7 40	Aug. 2	3 10	7 30
2	7 40	3	4 10	8 30
3	7 40	4	4 20	8 40
4	7 40	5	4 20	8 40
5	7 40	6	4 20	8 40
6	7 40	7	4 20	8 40
7	7 40	8	4 20	8 40
8	7 30	9	4 20	8 50
9	7 30	10	4 20	8 50
10	7 30	11	4 20	8 50
11	7 30	12	4 20	8 50
12	7 30	13	4 20	8 50
13	7 30	14	4 30	9 00
14	10 20	15	4 30	6 10
15	11 00	16	4 30	5 30
16	11 50	17	4 30	4 40
18	0 50	18	4 30	3 40
19	2 00	19	4 30	2 30
20	No Light	20	No Light	
21	7 20	21	9 20	2 00
22	7 20	22	9 50	2 30
23	7 10	23	10 10	3 00
24	7 10	24	10 40	3 30
25	7 10	25	11 00	3 50
26	7 10	26	11 40	4 30
27	7 10	28	0 20	5 10
28	7 10	29	1 10	6 00
29	7 10	30	2 00	6 50
30	7 10	31	3 10	8 00
31	7 00	Sep. 1	4 20	9 20
		Total	....	189 40

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ADVERTISEMENTS.

Orders for advertising should reach the office of publication not later than the 20th day of the month preceding date of issue. Changes in advertisements will be made whenever desired, without cost to the advertiser.

SUBSCRIPTIONS.

The "Electrical News" will be mailed to subscribers in Canada and Great Britain, post free, for $1.00 per annum. United States and foreign, $2.00. Remit by currency, registered letter, or postal order payable to Hugh C. MacLean, Limited.

Subscribers are requested to promptly notify the publishers of failure or delay in delivery of paper.

EDITOR'S ANNOUNCEMENT.

Correspondence is invited upon all topics coming legitimately within the scope of this journal. Subscribers can materially assist by sending in news items and information regarding electrical development in all parts of Canada.

Vol. 19 Toronto, September, 1910 No. 9

Shall the C. E. A. Affiliate?

At the recent convention of the Canadian Electrical Association the question of the affiliation of the Canadian Association with the National Electric Light Association was varied. Even to delegates who heard of the movement for the first time, it was evident that such a step should not be taken without careful consideration of the consequences, and fortunately the convention did not commit itself or take any action beyond a limited discussion and the appointment of a committee to consider the matter and report. Short as the discussion was it was plain that very decided opinions were held on both sides. It is interesting to note that the same question at about the same time was being discussed by the members of the Wisconsin Electrical Association, who in reporting against affiliation classified their reasons as follows:

1. Affiliation would eliminate all those connected with municipal plants.
2. Requirements for dues would be largely increased.
3. The N. E. L. A. does not include a railway section.

It will be remembered that although the constitution of the National Electric Light Asociation is followed fairly closely by the Canadian Electrical Association exception is taken to the clause prohibiting membership of municipal representatives. The Canadian Electrical Association welcomes these as full members with the one minor exception that they are not allowed a vote in the election of officers. This is a matter that will come in for discussion in these pages at a later date. The exclusion of street railway matters is also a point that was not considered at the convention. In view of the great interest that many street railway men have taken in our Association in the past, and the valuable services they have rendered it would seem that the loss of their membership would be a serious matter. It is certain that the exponents of affiliation must point to some very decided advantages before the Canadian Association will see its way clear to sever its connection with these two sections of its present membership.

The whole matter cannot be decided in a few minutes, however, nor the arguments either for or against stated in a few words. We believe much good would result from a healthy discussion among the members of the Canadian Association. If the "Electrical News," by so doing, can further the cause of the Canadian Electrical Association we will gladly print any arguments that may be advanced on either side or any expressions of opinion that may be forwarded to us.

The Automatic Telephone in Canada

Interesting data is just to hand relating to the installation and maintenance of the automatic system of telephone operation in Edmonton, which is described at length in the telephone section of our present issue. It will be recalled that an automatic system was evolved by three Canadian boys in Brantford, the Lorimer brothers, and a description of the Brantford installation was given in these pages about a year ago. Another Ontario town which has shown its faith in this more scientific method of operation is Peterboro, and Lindsay is also installing an automatic plant at the present moment. The Canadian patent is controlled by the Canadian Machine Company, of Toronto, F. D. MacKay, general manager, under whose supervision the above plants have been installed.

In the West there are also three installations—Edmonton, described in this issue, Strathcona and Lethbridge, the latter two by the Alberta government. These have all been installed by a United States company, but the system as it works out for the subscriber seems to be very similar to the Canadian scheme. Both are working very satisfactorily. It may be there will yet be improvements and simplifications in the automatic apparatus, but, sooner or later, it seems pretty certain this type of telephone is destined to stand between the subscriber and the many little annoyances and delays which seem the inseparable accompaniments of the present manual arrangements.

Depreciation—A Myth or a Fact?

It had never occurred to the writer that there could be any doubt about the fact that any plant will depreciate in value, in efficiency, and in usefulness, no matter how favorable the circumstances, the rate depending, of course, on many factors; but the argument was recently advanced in all seriousness by the superintendent of an electric plant that if maintenance is properly cared for there will never be any need for a depreciation account. This, by the way, was a municipal plant, and herein lies, we believe, one of the chief differences between privately operated and municipally operated concerns. As a clincher, this superintendent added "why need we care any way, if at the end of the debenture period when all our debts are paid, this plant has no value. We are then in exactly the same position as when we first installed our plant. Let the next generation purchase and pay for their own plant if they want one."

Now, the question of whether a depreciation allowance is or is not a necessity will be decided with time. Municipalities that persist in ignoring the necessity for it and are still operating at a profit, cannot be pointed as examples, because the municipal idea in Canada is younger than the natural life of most of the systems the municipalities are operating. If one may judge by the older established institutions, banks, milling companies, railways, steamship lines, telephone companies, electric operating companies of all classes, etc., the conclusion is inevitable that long experience has led our wisest financiers to make provision for the replacement, at some future time, of the various parts of the systems operating under their control. Many of these companies set aside a certain fixed percentage of their capital each year; for example, the Consumers' Gas Company, of Toronto, each year places in a depreciation reserve account five per cent. of the value of the plant and buildings in use. Other companies determine the amount to be set aside from year to year as the varying profits will allow. But whatever the method the main thing to be realized is this,—that our more experienced and saner financiers admit the necessity for a yearly depreciation allowance.

Let us suppose for a moment that the second statement is defensible—that "sufficient for the day" is a possible attitude for any municipality to take,—and let us compare the financial statements of the municipalities year after year for signs of any acknowledgment that the property is in any year placed at a lower valuation than in the previous year. Do we find any signs? The writer has before him a copy of the financial statement of a carefully and successfully operated municipal electric light plant. The statement shows that debentures to the extent of $240,000 have been issued during ten years with an average period of a little over 20 years to run. On the supposition that the natural life of such a plant is 20 years, the value of the plant on the books of the municipality should read about $120,000. As a matter of fact the item under "assets" reads—Plant, $249,000.

What would the countryside think of a farmer who paid $240 for a binder, used it for 10 years and then valued it at $249.

Canadian Exhibition to be Brilliantly Lighted

The Toronto Exhibition authorities are wisely recognizing the necessity for the highest possible factor of safety in their electrical arrangements and this year will spend a large sum of money in laying underground conduit, replacing the old exposed conductors with new ones of much larger carrying capacity, by better transformer arrangements, each building now being supplied by its own bank and by a central point control instead of, as before, having switches at various points in the different buildings. This is especially reassuring in view of the heavy Brussels' fire of a few days ago, which brings home to us the almost incredible loss that a fire in an exhibition of even such proportions as the Canadian National might entail.

The total expenditure for electric lighting extensions will be about $75,000, included in which are 75 new ornamental posts to carry each a group of three multiple connected Sunbeam tungsten lamps of the 110-volt, 60-watt type. These ornamental posts are being placed around the main plaza road, around the horticultural building, and along the driveway to the main gateway. The entrance to each building is also being lighted by this system. The ornamental posts are of cement and, we understand, are supplied by the Roman Stone Company.

Each building is also being outlined by a row of carbon 8 c.p. lamps running along the eaves, placed at intervals of two feet. These are being installed with Norbit sockets, one reason being that the wires can be removed and used for other purposes since this socket makes contact by simply puncturing the insulation. The interiors of all the main bulidings have also been rewired with larger conductors, for 25 cycles and 110 volts, although wherever required by an exhibitor 60 cycles current will be obtainable.

It is worthy of note that in Machinery Hall the steam engines used formerly for driving the various exhibitors' apparatus have been removed and two 50 h.p. motors installed by the Jones & Moore Company.

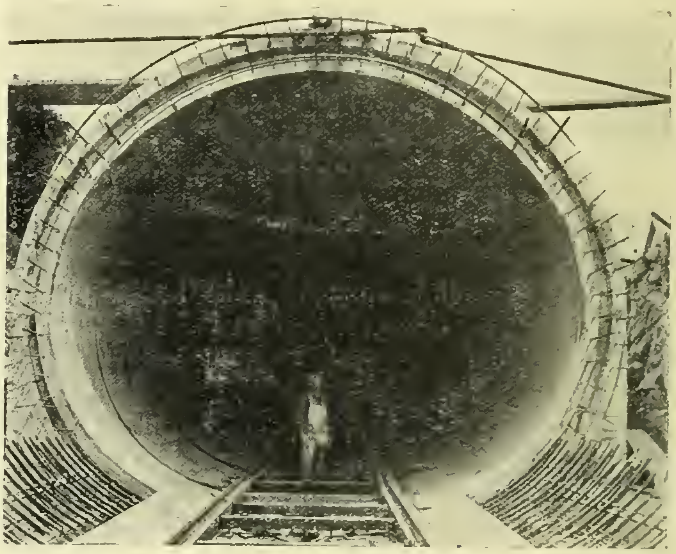
All the temporary installations are in charge of the Toronto Electric Light Company, who supply the transformers for the various buildings, and whatever temporary lamps are needed, as well as the current for all requirements. It is calculated that about 6,000 additional small lamps will be used this year, in addition to which one large decorative sign alone, being installed by Death & Watson, will call for 1,160 lamps.

New Pipe Line for Ontario Power Company

On the 25th of July the water was turned into the new 18-foot reinforced concrete conduit of the Ontario Power Company in Queen Victoria Park, at Niagara Falls. Great interest attaches to this event as this is the first example of the application of reinforced concrete to pressure pipe construction of anything like this magnitude anywhere in the world. Although the conduit is complete and ready for service, it has still to be covered, by the refilling of the trench in which it is laid. On the completion of this work the surface of the park will appear as usual, the conduit being entirely concealed.

The conduit, which has an effective internal diameter of 18 feet, is 6,300 feet long, connecting the company's headworks at Dufferin islands with its distributor just below Table Rock. Its walls have a thickness of 18 inches, and are composed of reinforced concrete, both longitudinal and circumferential bars being used. It is of oblate form, the flattening being more pronounced on the bottom than on the top, this form being used for both engineering and economic reasons. It rests throughout its length on a concrete foundation.

An interesting feature of the work is the fact that all the materials used have been of Canadian origin or manufacture, the two chief ingredients, the cement and the steel, having been purchased from two of the power company's own customers, the Canadian Portland Cement Company and the Ontario Iron & Steel Company.



New 18 foot Diameter Water Conduit Tube for Ontario Power Company

The primary purpose of this conduit, which is the second the company has constructed (the former being of steel), is in connection with the extensions which are now in progress in the company's generating station. It is connected, however, by bypasses, with the first conduit so that a portion of its power is immediately available through the apparatus already in operation.

Seymour Power Company's Rapid Extensions

In our June issue we printed an illustrated description of the hydro-electric installation of the Seymour Power & Electric Company on the Trent Valley canal at Campbellford, but rapid extensions have been made in the intervening months. The generators in the main power house have been added to, until now instead of two there are four (the fourth being practically ready for operation), and the fifth and final unit is ordered. This has necessitated the extension at both ends of the power house in accordance with the original plans, which have, however, matured much earlier than was expected. The full equipment of transformer and switching apparatus has also been growing rapidly and will be complete in a few days.

Extensions to the distributing system include the completion of the substation at Campbellford for the supply of power to the Northumberland Pulp Company, a high tension transmission line extension east from Belleville to Point Anne (almost completed), a distance of five miles, with a substation at that point to supply the Point Anne Quarries, Limited, stone crushing plant, and a further extension of the same line about a mile farther on to the plant of the Lehigh Portland Cement Company, situated on the Bay of Quinte, where another substation is practically completed.

The Lehigh substation will be fed by two 44,000-volt incoming line and will contain four 750 k.v.a., 3-phase, 44,000/600-volt step-down transformers, C. G. E. type. In a few months the complete plant will be electrically operated for which purpose the cement company will install four 600 h.p. induction motors to replace the present equipment of two 1,200 h.p. St. Louis Corliss engines now driving the mill and two 400 k.w. engine driven generators.

Another Development on the St. Maurice

The development of La Tuque river and rapids on the St. Maurice river, Quebec, a tributary of the St. Lawrence, for electric purposes, is reported. La Tuque is some eighty miles above the now famous Shawinigan Falls, where power to the extent of 150,000 h.p. is available. The La Tuque Falls, together with rapids, along a distance of about half a mile, give a natural fall of 88 feet. The volume of the river is nearly 8,000 cubic feet per second. At the head of the rapids the river is described as exceedingly narrow, 40 to 50 feet at low water, and it has been said by expert engineers that it would be difficult to find a point better adapted for the construction of a dam. Such a dam could raise the water 12 feet, making its total head an even 100 feet. A flow of 8,000 feet a second with this head would develop over 90,000 horsepower. An interesting feature of the situation is a second channel, through which the surplus water also escapes at high mark. This natural spillway is of solid rock lying between two elevations also of rock.

Tungsten Street Lighting in Barrie

The electric light plant of Barrie, as also the waterworks system, is owned and operated by the municipality. The immediate supervision is in the hands of a trio of commissioners, composed of Mayor Beecroft, and Messrs. J. B. Dougall and J. H. Bennett. The two generators are steam driven, the smaller one of 150 k.w. capacity, Royal Electric type, now used chiefly for the lighter day load; the larger one, an A.C.B., 800 k.w., 2,300-volt, 150 r.p.m. machine for heavy load hours. Liberal allowances are made from year to year for maintenance and the plant consequently renders a very satisfactory service. All customers are on meter on a 9½-cent rate, with graded charges for the larger consumers. For the last seven years the balance has been on the right side and has varied from $200 to $2,500 a year.

The street lighting system is an especially well managed department of the electric plant. Up to the present year the town has been lighted by 52 enclosed arc, 6.6 ampere lamps, which cost $45 a year on a moonlight midnight schedule. Within the last year 60 tungstens of the 40-watt, 6.6 ampere type have been added to extend somewhat the area illuminated and to fill in gaps not sufficiently served by the arcs. The cost to the town of operating the tungstens is $20 a year for an all night service.

It will be noticed that the current requirement of both types of lamp is the same, 6.6 amperes, although they are on separate circuits, each operated by its own constant current regulator. The object of this arrangement was to allow an interchange of lamps between the two systems, if necessary, or an addition, for some special purpose, of a number of lamps of the one type to the other circuit. The wisdom of this piece of foresight is now being evidenced, as the requirements of a certain section served by the tungsten circuit call for a specially bright illumination and it is proposed to install a number of arcs in this section on the tungsten circuit.

The plant is operated under the able superintendence of Mr. Hare, to whom much is due, both for the efficiency of the service and the financial success of the investment.

False Reports About Cobalt Hydraulic

In the present issue a short description is given of the plan of construction of this air compressing system, and it has given us pleasure to speak of such a cleverly designed plant in terms of well deserved praise. For some reason it appears that the daily press has been unfortunate in getting "wind" of more than one unfounded report of the unsatisfactory operation of this plant, that they have not been sufficiently careful to investigate and deny. A few weeks ago it was said that the air being supplied to the mines was unfit for breathing, when, as a matter of fact, no single miner had ever acknowledged or has yet acknowledged that he was able to detect the slightest difference between the compressed and ordinary air, for breathing purposes.

Now, ten days ago, comes the report that the pressure cannot be maintained, that the plant has shut down and that the cost of repair will reach $40,000. Again it is very gratifying to know that there has been no difficulty whatever at the plant, there has been no shut down, and the regular pressure of 100 pounds is being maintained at the mines—the source of the whole story being the wanton waste of air in some of the mines not yet using meters. A communication from Mr. C. H. Taylor, the superintendent, under date of August 9th, makes this matter quite clear. The letter runs as follows:

"We had some malicious wastefulness of air at the mines, particularly in unworked drifts, that resulted in pulling our pressure down slightly, but the trouble only lasted for a few days, and we are now maintaining 100 pounds pressure at the various mines. As we have only about 1/5 of the meters installed at the present time, the mines not yet on meters are using the air indiscriminately. I may state in conclusion that we are running to-day the same as we were the day you were here and have never shut down or even contemplated shutting down the plant."

St. Boniface Closes Power Agreement

Negotiations which have been under way for some months between the town of St. Boniface, Man., and the Great Falls Power Company, represented by Mr. C. Chamberlain, resulted on the 8th inst. in the council of St. Boniface authorizing Mayor Bleau and the city clerk to sign a contract with the company for the supply of power, the following being some of the principal conditions:

Three-phase, 60-cycle, 2,200-volt power is to be supplied at the city's substation to be erected in St. Boniface by the 1st of January, 1912.

The prices to be paid are to be based on the amount of power required by the city. 3,000 horse power is to be taken at first at a price of $22 per horse power. For 4,000 horse power the rate is to be $20; for 5,000 horse power, $18, and for quantities above 5,000 horse power a minimum rate of $17 is to be charged per horse power per annum. The power is to be measured on the low tension bus bars.

The company is to furnish a bond of $20,000, as a guarantee of the performance of their part of the contract, at the time the contract is signed.

The company is to build and maintain its transmission line from the generating station to the substation in St. Boniface, which, though it is not definitely stated in the contract, is evidently to be built by the city.

The company is to guarantee a voltage regulation of not to exceed five per cent. above or below normal.

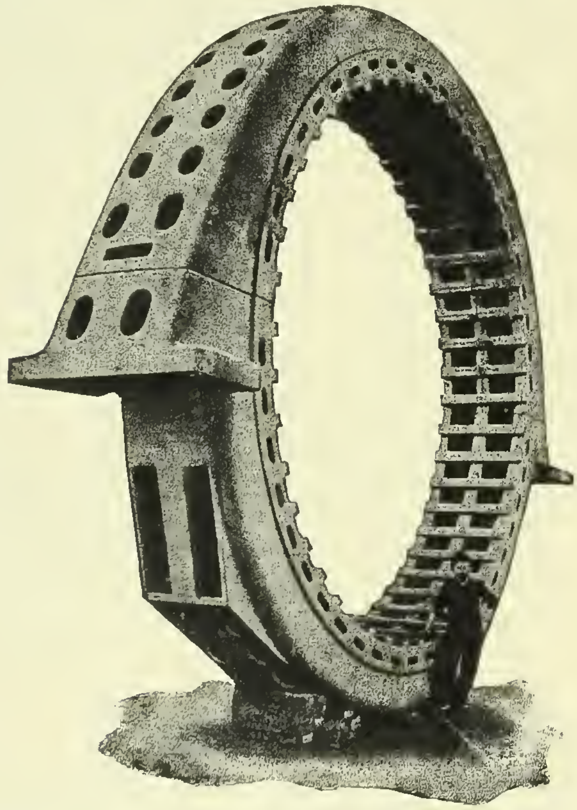
Record Generators for Ontario Power Company

The accompanying illustration shows one of the armature castings recently made by the Canada Foundry Company for the new generators being built for the Ontario Power Company, Niagara Falls, by the Canadian General Electric Company.

There are three of these machines each of 12,500 horse power, being some of the largest electric generators on this continent.

The casting was moulded and cast in one piece, in order to ensure true shape, and divided into upper and lowed halves by the use of cores.

Some idea of the immense size of the castings can be obtained by comparison with the figure in the photograph. The measurement across the first is 27 feet with a mean outside diameter of 23 feet and being 4 feet wide across face of poles.



Casting of one of three C. G. E. Generators being installed for the Ontario Power Company

The order for these generators, it will be remembered, was rendered immediately necessary by the Ontario Power Company's contract to supply 60,000 h.p. to the Ontario Hydro-Electric Commission for distribution over southwestern Ontario and east to Toronto.

Lethbridge's New Generator Ready

When early in the summer of the present year Lethbridge's new power house and electric installation were nearing completion it was believed that with the old power plant as an auxiliary the town would be efficiently supplied with light and power for some time. The disastrous fire, however, which completely destroyed the old plant just a few days before the new one was ready for operation left the town in little better circumstances than before, and a hurry-up order was placed at once with the Westinghouse Company for an additional 500 k.w. generator. This is now ready for shipment, we understand, and will reach Lethbridge about the end of the present month. The total Lethbridge installation is now 850 kilowatts, the first unit having 350 k.w. capacity, all new and up-to-date apparatus in a fine new power house. Unfortunately water powers are rare in this district and the generators are steam driven, engines of the Belliss & Morcom make being used. Smith, Kerry & Chace are consulting engineers for the town.

Electric Railway Scheme for Nanaimo

The Dominion Stock and Bond Corporation, of Vancouver, through their manager, Mr. G. H. Salmon, has submitted a street railway proposition to a joint committee, composed of representatives of the Citizens' League and of the council of Nanaimo, B.C. The joint committee has approved the proposal and it is probable a by-law will be submitted to the electors at an early date giving the council power to complete arrangements with Mr. Salmon.

The proposed scheme includes a suburban railway system connecting several of the neighboring towns with Nanaimo, as well as a local service covering several of the streets. The total length of line will probably be in the neighborhood of 20 miles.

It is the intention to finance the expenditure by the issue of bonds to the amount of $400,000, bearing interest at 4½ per cent. which the city must guarantee, the company agreeing to provide a sinking fund of 10 per cent. of the net profits each year until the total sum of the bonds and interest has been paid. An exclusive franchise for 40 years is one of the concessions to the company, the city retaining the right, however, to purchase the system, calculating the company's profits on a minimum basis of 6 per cent., by giving twelve months' notice of such action at the end of either the first or the second 20-year period. If the by-law is passed work will commence within sixty days from that date.

Progress of Winnipeg's Municipal Power Plant

The hydro-electric power plant for the city of Winnipeg is progressing rapidly under weather conditions that for the past three months have been ideal. The concrete work of the power house is now well above the level of the generator floor, and this part of the work is expected to be ready for the installation of machinery by the first of October at the latest. The first one of he 5,200 h.p. turbines has been completed and shipped from the works of the Jens Orten-Boving Company, in Sweden .

Of the 77 miles of transmission line between the generating station at Point du Bois and the terminal station in Winnipeg two miles have been completed. Practically all the towers and about half of the aluminum transmission cable have been delivered. At the end of July 526 of the towers had been assembled and 61 erected.

Work on the Rover street terminal station, where the high tension power is to be received and transformed down to 12,000 volts, is also progressing rapidly. This station will probably be completed by the 31st of December, 1910.
of three miles from the terminal station in the city's pumping

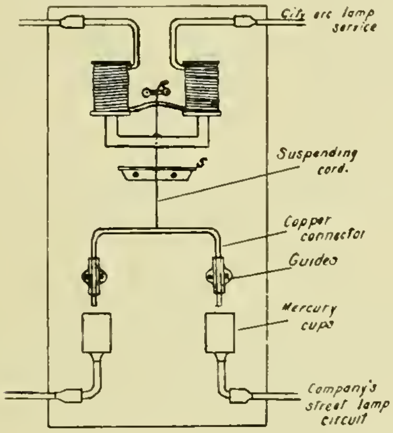
The first section of the underground conduit system, a stretch station on McPhillips street, is under construction, having been commenced in the latter part of June. This conduit is to carry 12,000-volt paper insulated lead covered cable. Twelve single ducts of 3½-inch tile are being laid in four layers of three ducts each. The tile is laid in concrete with a 1½-inch space between ducts filled with cement mortar. This construction has been adopted in preference to the multiple duct system in spite of a somewhat increased cost on account of its great strength and consequent increased reliability. Manholes are being placed at intervals of about 350 feet, this having been decided upon as a very safe spacing for drawing in the heavy cable for which the ducts are to be used.

Messrs. Smith, Kerry & Chace, the engineers in charge of the work, report that in spite of difficulties in getting steel for the power house and other causes of delay, the work is practically certain to be completed and power available in the early part of 1911.

Clever Automatic Switch Device

An ingenious switching device is used by the Ottawa Electric Company on their suburban street lighting circuits. Formerly it was necessary to employ a man to make the rounds and throw the circuits in and out by hand. The apparatus is mounted on a marble panel and consists of two coils in series with the municipal arc lamp circuit, a magnet which actuates the copper connector by means of a silk cord attached to it through the brass ring R, and two mercury cups in series with the company's street lamp circuit, into which the ends of the conector drop. The device is illustrated in the accompanying cut.

When the city arc service is turned on, the series coils are energized and draw up the magnet, the cord slides through the ring allowing the connector to drop of its own weight. Two guides ensure the legs of the connector dropping evenly into the mercury, thus closing the company's circuit.



On the opening of the city circuit the coils become dead and the magnet drops onto the shelves. As the weight of the magnet is greater than that of the connector it pulls the cord through the ring R, thus raising the connector out of the cups and opening the company's circuit.

The device is housed in a wooden box mounted on the arc lamp pole, most convenient to the company's circuit. The only attention required is an occasional inspection to see that the mercury cups are filled and that the cord is in good condition. The originator is Mr. R. P. Moody, a former employee of the company.

Northumberland Pulp Company now Operating

The Northumberland Paper & Electric Company is an old organization situated on the Trent Valley canal in Campbellford. Realizing the advantage of a near-by market for pulp and the further advantage of cheap electric power at that point, the Northumberland Pulp Company was recently organized for the extensive manufacture of pulp by electrically driven machinery. To accommodate this plant the Seymour Power & Electric Company has extended its transmission line to and constructed a sub-station at this point, the sub-station, in fact, being under the same roof as the pulp manufacturing machinery, the complete installation being supervised by the engineering firm of Smith, Kerry & Chace.

The building is constructed of poured concrete and is situated on the west bank of the Trent river at the south side of Campbellford, and just north of the Northumberland Paper & Electric Company's building, to which it will supply part of its pulp manufacture.

The electrical equipment of the substation consists of a 1,125 k.v.a. 44,000/2,400-volt, 3-phase transformer, Westinghouse manufacture, with C. G. E. switchboard equipment. For the pulp mill one 600 h.p. induction motor, C. G. E. type, direct connected to two pulp grinders, is already operating. It is the intention to install a second similar motor in the immediate future to drive two more grinders. The remainder of the pulp apparatus such as wet machinery, screens, pumps, etc., are all motor driven, these being supplied for the most part by the Westinghouse Company. The plans provide for the final utilization of 1,500 h.p.

Diesel Oil Engine vs. Steam or Gas

In view of the announcement, on another page, of the placing of an order for the first Diesel oil engine in Canada, a few words of description as to the comparative merits of this form of prime mover, as claimed by the manufacturers, will be of interest.

The Diesel engine differs, let it be understood, from other oil engines in that it uses fuel oil costing in bulk about three cents a gallon; this in itself constitutes a considerable item in operating costs. Though new to Canada the last half-dozen years have seen a number of successful installations in England and on the continent, and the following figures of actual operating costs, taken at different points, illustrate the extremely low cost of maintenance of three types of Diesel engines manufactured by different firms:

Total Operating Costs of Diesel Engines.

Item.	Costs per kilowatt at the switchboard, in cents. Daimler.	 Mirrlees.	 Yardley.
Fuel (crude oil)	0.482	0.358	0.402
Wages	0.192	0.164	0.164
Lub. oil, waste, water, stores, etc.	0.040	0.036	0.066
Repairs and maintenance	0.056	0.120	0.120
Total operating costs per k.w. hr.	0.770	0.678	0.752

The claim is made for the Diesel that it can be operated at from one-half to one-third of the cost of a steam engine, and the following figures claimed by Diesel manufacturers appear to bear out this claim. The table also includes figures on producer gas. This data is taken from station generating current for electric light only where the load factor is generally low—a condition which, it is claimed, is especially unsatisfactory for the Diesel engine.

Average Total Operating Costs.

Item.	Cents per k.w. hour generated. Steam.	 Prod. Gas.	 Diesel.
Fuel	1.78	1.74	0.60
Oil, waste, water, stores	0.24	0.38	0.06
Men's wages	0.64	1.36	0.34
Repairs and maintenance	0.74	1.60	0.16
Total operating costs per k.w. hour generated	3.40	5.08	1.16
Load factor	12.45%	16%	14%

In localities not well supplied with water power or where the ratio between the price of coal as fuel and crude oil is in favor of the latter, it is reasonably certain that this type of engine will meet with a constantly increasing demand in Canada. The Moose Jaw installation will be put in operation with all speed and will furnish valuable figures for comparison.

The Age of the Tungsten "Arc"

Great strides have been made of late in the manufacture of tungsten incandescent lamps. A short time ago these lamps could not be made to burn at 100 volts and over to give less than 30 c.p., which, while showing an enormous economy to those requiring that amount of light, restricted the use of the lamp where less light was required. The disadvantage has now disappeared for the new improvements enable the lamp to be manufactured for any ordinary range to give candle powers ranging from 16 to 1,000.

The illustration given herewith is of a 1,000 c.p. Osram lamp, the largest size being manufactured at present, with special fitting designed for street and warehouse lighting. These will be found cheaper than enclosed arc lamps, both as regards first cost and maintenance, no attendant being required for trimming the carbons, keeping the globes free from carbon dust, etc. The filaments of these 1,000 c.p. lamps have been very liberally designed, being nearly 10 inches in diameter, making them very durable. It is interesting to know that they have been in commercial use for a considerable length of time for street lighting in England. Other types of the same lamps are illustrated in this issue's advertisements.

City of London Lets More Contracts

The city of London recently awarded the contracts for service transformers and meters. The order for transformers totals in the neighborhood of 1,000 k.w., made up of from 30-35 units varying in size from 10-50 k.w. each. This contract was awarded to the Packard Electric Company.

The contract for meters for the first year's operations has also been awarded to the Ferranti, Limited, company. The size of this order is, of course, impossible to estimate and depends on the amount of business the city is able to work up. It is easily possible, however, that the requirements may run up to 500 meters or even higher.

Convention Echoes

The display of Nernst lamps in the Japanese room, under the genial management of Mr. A. E. Fleming, was an attractive feature of the three days' visit to the Royal Muskoka. Especially the small four-light chandelier displayed was greatly admired and seems to combine grace and efficiency in a remarkable degree. There does not seem to be any reason why these small lamps should not be adjusted for house lighting. If the sockets could be set into the wall or ceiling, the effect, with only the spherical part exposed, would be very pleasing and the illumination should be highly satisfactory.

The souvenirs of the Canadian Tungsten Lamp Company and the Northern Electric & Manufacturing Company, the former a germ-proof telephone mouthpiece, the latter a B. & S. standard, direct-reading wire gauge, were more practical than similar ideas usually are and will remind the delegates for many a day of their short stay in the beautiful summer resort.

The many who remarked the attractive appearance of the well illuminated large dining and living rooms, probably were not aware that the kindness of the Canadian General Electric Company was responsible for most of the installations. This was only one instance of many, shown by Mr. Nicholls and his company, that they have the interests of the Canadian Association very much at heart.

The Ferranti, Limited, display of small meters and heating appliances in their private apartments also came in for its due share of inspection, and the curious inquirers were courteously attended to by Messrs. Monahan and Simmons. It is claimed for the heating apparatus, that its heating efficiency is greater than that of any other similar apparatus and that the heating element is indestructible.

The following little degression, signed "F. R. D.," was handed to the "Electrical News" the "morning after" the convention dinner:

"Last evening the C. E. A. held their annual banquet in the beautifully illuminated and artistically decorated 'salle mangée,' and, according to the 'high tension' of hilarity 'transmitted' to their 'mental receptacles' through dangerously 'high potentials' of claret and champagne, their 'personal magnetism' will be almost 'neutralized' this morning. And sleeping tendencies and mental depressions will be 'short-circuited' 'burning out' the balance of their 'feeble or low resistance' to become well 'grounded,' causing their intellectual 'flaming arcs' to be out for perhaps the entire day. Of course, some of them, who were wise enough not to run a '10 to 25 per cent. overload' last night, will be running quite 'smoothly and perfectly balanced' this morning, and will be quite able to take their share of the 'business load' to-day without 'excessive sparking or heating.' "

An Acknowledgement.

The Canadian Electrical Association gratefully acknowledges contributions from the following firms towards the entertainment expenses of the recent convention at the Royal Muskoka: Allis-Chalmers-Bullock, Limited, Toronto; Alpheduct Manufacturing Company, Toronto; Canadian Boving Company ,Toronto; Canadian British Insulated Company, Montreal; Canadian General Electric Company, Toronto; Canadian Niagara Power Company, Niagara Falls; Canadian Westinghouse Company, Toronto; Conduits, Limited, Toronto; Dominion Power & Transmission Company, Hamilton; Factory Products, Limited, Toronto; Goldie & McCulloch Company, Galt; Imperial Varnish & Color Company, Toronto; Lancashire Dynamo & Motor Company, Toronto; International Varnish Company, Toronto; E. Leonard & Sons, Limited, London; Hugh C. MacLean, Limited, Toronto; Montreal Light, Heat & Power Company, Montreal; Northern Aluminum Company, Toronto; Northern Electric & Manufacturing Company, Montreal; Ontario Power Company, Niagara Falls; Otis Fensom Elevator Company, Toronto; Parke & Leith, Toronto; Eugene F. Philips Electrical Works, Toronto; Queen City Oil Company, Toronto; Rogers Electric Company, Toronto; Standard Underground Cable Company, New York; Sunbeam Incandescent Lamp Company, Toronto; Toronto Electric Light Company, Toronto; Wire & Cable Company, Montreal; Waterous Engine Works, Brantford; Toronto Power Company, Toronto.

Electric Power for Point Anne Quarries

The Point Anne Quarries, Limited, stone crushing plant, is situated four or five elmi seast of Belleville on the Bay of Quinte, where they crush limestone for making concrete and ship to Toronto in boats. The plant operates generally from the early part of April to the middle of December. Up to the present time power has been obtained by steam engine, direct connected to the crushers and from a steam driven generator, 75 k.w. capacity, to furnish light and also power to a 35 h.p. motor for driving the conveyor belt. At the present time, however, the Seymour Power & Electric Company are extending their transmission line east from Belleville to this point, and have about completed the construction of a substation for the supply of electric power to the stone plant. The substation will contain two 300 k.w., 44,000 600-volt, 60-cycle, 3-phase step-down transformers, C.G.E. manufacture, as well as high tension oil switches, electrolytic lightning arersters, low tension switch panel, etc., also supplied by the Canadian General Electric Company. The requirements of the quarries will, for the present, be about 300 horse power, to utilize which new electrical apparatus is being installed so that the total system will be electrically operated in the very near future.

Electrical Progress in and around Winnipeg

The Winnipeg office of the Canadian Westinghouse Company report a good month's business in the West for the month of July. Among the important orders received were four engine type direct current generators for the government of Alberta, with switchboards, etc. Two of these, a 150 k.w. and a 50 k.w., are for the Penoka Asylum, the other two, a 65 k.w. and a 35 k.w., are to be used in the Lethbridge gaol. Three alternating current generators, with exciters and switchboards, were purchased by the Canadian Northern Railway Company, two 50 k.w. engine type machines and one 30 k.w. belt driven. These plants are to be used for lighting purposes at three of the company's divisional points. A 150 k.w. direct current engine type machine was also purchased by the Leitch Collieries in the Crow's Nest Pass.

Plans are to be submitted to the Winnipeg city council on Monday, August 15th, for a building to contain the fire alarm system and a complete new police patrol signal system. If the plans are approved work on the building will be commenced at once and tenders will be called for the patrol signal system, which is to include 200 patrol signal boxes.

Preparations are being made by Mr. F. A. Cambridge, city electrician of Winnipeg, for the installation of 100 magnetite street arc lamps and three 50-lamp regulators which have recently been shipped to the city from the Canadian General Electric Company. This is the second lot of magnetite lamps to be installed in Winnipeg, 50 lamps and a regulator having been installed in 1909.

Westinghouse Equipment for Revelstoke

The town of Revelstoke, B.C., some time ago decided that its progress was being unwisely retarded by inadequacy of electric light and power, and that it would enlarge its plant. The old installation consisted of two small units, one a single-phase, the other a three-phase generator, which were driven partly by gas engine, but also partly by water wheel, Revelstoke being situated on the Columbia river. The additional electrical equipment to be installed, which is Westinghouse manufacture throughout, consists of one 450 k.w. generator, direct-connected to a Jenckes waterwheel, one 250 k.w. generator belt driven, and the necessary switchboard accompaniments. The generators are 60-cycle, 3-phase, 2,300-volts. The old 3-phase generator is also being retained. The firm of Smith, Kerry & Chace have the installation in hand. A new power house to accommodate the enlarged requirements is nearing completion and the electrical apparatus will be shipped before the end of the present month.

Quebec Railway, Light, Heat & Power Company

During the present season the Quebec Railway, Light, Heat & Power Company, under the general management of Mr. C. E. A. Carr, has carried out extensive improvements to their traction system in Quebec and district. The company is operating at the present time 56.22 miles of track, of which number 17.22 miles are within the city limits and 39 miles are suburban. 141 cars comprise the rolling stock of the company. Of these 35 are closed and 34 open motors cars and are operated on the city circuits, while the balance are located on the Montmorency division. In addition to this there are 107 freight cars of various descriptions, and five steam locomotives for service in handling the numerous pilgrimage trains from foreign roads.

At Montmorency Falls, the company operates an amusement park. The Kent House, famous in history, is also located at this point and is at present being enlarged at a cost of approximately $50,000.

The engineering department is working on right-of-way plans for an upper level line to Montmorency Falls Park, and it is proposed to start this line, leaving the present main line at the village of Beauport, gradually ascending the grade until the summit is reached. At present the Falls Park is reached by means of an incline elevator.

An extension to the lines west from the city to the top of Sillery Hill, near the new Quebec bridge site, is at present under way and will add an additional two and a half miles to the trackage. Sixteen pay-as-you-enter cars and one large observation car have also recently been purchased.

At the corner of Crown and St. Joseph streets a modern eight-story office building is in course of erection. It will be finished granite, brick and terra cotta and will be fireproofed throughout. When this is completed the management will be enabled to consolidate all their offices which at present are scattered throughout the city.

The electrical equipment of the company is also being changed and added to. At the Queen street sub-station several changes are under way, which will enable the company to concentrate their distribution largely from this point.

Projected Extension in Sherbrooke, Que.

So many applications have been received for power by the Sherbrooke Railway & Power Company that the directors, forseeing the inadequacy of the present installation for any length of time have purchased the Westbury Basin water power, which is located about 18 miles out of Sherbrooke. This power is reported by the company's engineers to have a capacity of about 3,000 horse power.

In connection with street railway extensions the company states that provision has been made not only for the doubling of the mileage of the existing system, but also for entirely relaying the existing tracks and purchasing new rolling stock. The street railway franchise extends until 1950, with the right to the city to purchase it as a going concern in 1930.

Successful Municipal Operation in Calgary

Municipal ownership of their street railway system is proving an highly satisfactory undertaking in Calgary, according to the last financial statement. The total investment to date is placed at $476,000 and gross profits for the year 1910 are estimated by Mayor Jamieson at $200,000. The road began operation, using 15 cars, which will be increased to 18. Power one year's experience and if realizable is indeed creditable to the management. There are 16½ miles of road at present in operation, using 15 cars, which w lilbe increased to 18 . Power as yet is generated by steam, but a hydro-electric installation at present under construction on the Bow river, 50 miles out of Calgary, will probably supply the city's requirements in the near future.

Mayor Jamieson claims that the railway profits for the year will be sufficient to write off 5 per cent. for depreciation, provide for sinking fund and interest, reduce the rate of taxation by one mill, and still leave a net profit of over 10 per cent. on the capital account. The fares are not excessive either and correspond closely with charges in many other street railway towns—a straight five-cent fare; six unlimited tickets for a quarter; eight limited tickets for a quarter; ten children's tickets for a quarter; twenty-five unlimited tickets for a dollar; free transfers to any part of the city. Plans are already under way for extending the line to the suburbs by an addition of 20 miles of track. This, with the necessary rolling stock, it is estimated, can be installed for about $500,000.

The administrative side of the street railway system is managed by a board of three commissioners, including the mayor. The city also supplies its own street lighting and sells current to private citizens at the low flat rate of six cents, with a further discount for prompt payment. At the present rate Calgary with its efficiently managed public utilities, street railway, street and private lighting and water system, and a constantly lessening tax rate bids fair to become the Glasgow of Canada.

Municipal Telephone System for Prince Rupert

Some months ago a few public spirited citizens of Prince Rupert, the western terminus of the Grand Trunk Pacific, in order to overcome the delay that would almost certainly attend either negotiations with a private company or the submission of a by-law allowing the municipality to take action, decided to build a telephone system and finance it out of their own pockets. In a comparatively short time the poles were up, the lines strung and Prince Rupert, the child of three years of age, was enjoying the luxury as well as reaping the profits of a modern telephone system. The sequel to the successful venture further shows the loyal spirit of these citizens, for the town has now been offered the chance of taking over the system at cost, some $20,000. The recent vote on the by-law which, by a majority of 174 to 9, authorized the council to accept the offer, indicates very plainly also the new town's opinion of municipal ownership. It is proposed to expend several thousands more on additional switchboard equipments and necessary extensions which, it is believed, will place Prince Rupert's telephone plant on a par with any to be found in older towns.

Contracts Let at Farnham, Que.

Work on the new power development at Farnham, Que., is progressing favorably and tenders for the construction of dam, flume and power house were opened about August 23rd. The contract for the supply and installation complete of two 300 k.w. generators, exciters and switchboard was awarded recently to the Canadian Fairbanks Company, Limited. The Canadian Boving Company was the successful tenderer for the waterwheel equipment and governors which contract includes the supply and installation of two sets of water wheels, two governors and all accessories. It is hoped to have this work at Farnham completed by the end of the year. Messrs. Ross & Holgate, of Montreal, are the supervising and designing engineers.

Canadian Light and Power Company's Annual Meeting

The annual meeting of the Canadian Light & Power Company was held recently in Montreal when the following Board of Directors was re-elected: President, F. H. Wilson; vice-president, E. A. Robert; and Messrs. Nathaniel Curry, Geo. G. Foster, K.C., Wm. C. Finley, F. J. Show, R. N. Smythe, J. M. Wilson, J. W. McConnell.

A very satisfactory statement was presented to the shareholders and also a progress report covering constructional operations at Valleyfield was received. The work has been well advanced and the cost is being found quite within the estimates of the engineers, Messrs. J. G. White & Company, of New York.

A contract for the structural steel requirements for the new terminal station has just been awarded to the Structural Steel Company, Limited, of Montreal, who will fabricate and erect its steel.

Electric Power for Porcupine

It is reported that interests closely associated with the E. A. Walberg, of Montreal, have secured a lease of the Wawatian Falls on the Mattagami river, where electric power will be developed for the Porcupine district. The location of this falls was shown in Mr. E. V. Rorke's map in the July issue of the "Electrical News," as No. 14. The natural head at this point is set down in Mr. Rorke's schedule as 60 feet, the minimum capacity as 2,700 horsepower, and the normal capacity under proper storage conditions at 6,700 horsepower. It is said, too, that the development of the falls would offer less than the average difficulties.

Montreal Notes and Personals

Mr. Chas. F. Medbury, manager of the Montreal district office for the Canadian Westinghouse Company, Limited, made a business visit to Halifax during the month.

Mr. Clarence Thomson, of Messrs. Fred Thompson & Company, is holidaying at Orchard Beach, Maine.

Messrs. R. J. Black, A. A. Dion and Prof. Herdt, who form the Board of Arbitrators to settle the claim of the Montreal Light, Heat & Power Company against the City of Montreal, held several meetings during the latter part of August and examined several witnesses on both sides. It is hoped that the investigation will not be much further protracted and that a decision will be handed out at an early date.

Professor Herdt is in Winnipeg in connection with the awarding of important cable contracts for civic power development at Point du Bois. Construction work is proceeding steadily and the power house is practically completed. About one mile and a half of conduit construction has also been finished.

The construction of the new power house and dam for the Sherbrooke Railway & Power Company, at Sherbrooke, Que., is progressing rapidly and it is expected that this work will be finished during the fall. Messrs. Ross & Holgate are the consulting engineers.

The Canadian General Electric Company have been awarded the contract for the transformers, lighting panels and steel lighting equipment for the municipal electric plant at Ingersoll, Ont. Messrs. Ross & Holgate are the consulting engineers.

British Consul Vicars in his report on the Lyons, France, district for 1909, where the Canadian Lorimer Automatic Telephone System has recenty been installed, states that after a full year's trial the system can be pronounced a success. He adds, however, that the government has not yet decided to take up the invention chiefly on account of the wholesale dismissal of woman operators that its adoption would necessitate.

At the Canadian National Exhibition visitors will have an opportunity of seeing the Royal Canadian Dragoons in their execution of the beautiful and intricate figures of the "Dragoon Cotillion."

Electric Items from our Western Coast

Victoria's street lighting system is being improved and extended. Sixty new arc lamps will be purchased from the Canadian General Electric Company.

The Western Canada Power Company, whose development plant at Stave Lake falls, 45 miles northeast of Vancouver, was described in last month's issue, have filed an amended agreement with the provincial authorities. It is now intended to increase the height of the sluice dam at the head of the east branch of the river, and the intake dam at the head of the west branch, so as to permit of the water being delivered at the power house at a head of 120 feet. An auxiliary dam is also to be constructed at a point about 300 yards above the sluice dam, the plans covering a structure 640 feet long and from 20 to 40 feet high.

Mr. R. H. Sperling, general manager of the British Columbia Electric Railway, and Mr. George Kidd, secretary of the London board of directors, recently inspected the work in progress at Coquitlam dam and walked through the two-mile tunnel through the mountain to Lake Buntzen, the enlargement of which has been in progress for the past year or more.

Mr. George Kidd, secretary of the London, Eng., board of the British Columbia Electric Railway Company, in company with Mr. R. H. Sperling, general manager, Mr. F. R. Glover, assistant general manager, and Mr. Allan Purvis, manager of interurban lines, made a sixty-mile tour of the lines on August 6th. The party left Vancouver for New Westminster via Eburne, then down to Huntingdon, on the new Chilliwack line, a distance of 46 miles. With the exception of a difficult section on Sumas prairie the rails have been laid as far as Chilliwack. Some 20 miles have been in operation for some weeks, and the traffic that has already developed exceeds all expectations. The roadbed has cost about $10,000 per mile in excess of the requirements for a steam railway, but the operation will be much more economical. The line will be completed in October, when Chilliwack, 60 miles distant, will be placed within a little over two hours of Vancouver. It is likely that four trains each way will be operated, with buffet car service and every modern convenience. The rolling stock at the outset will include ten passenger coaches, 150 freight cars, and engines capable of hauling a 500-ton load.

Latest Photograph of B.C.E.R. Hydro-Electric Development at Lake Buntzen.

The rapid growth of Vancouver is well attested by the great scope of the construction operations carried on by the British Columbia Electric Railway. Last year the company added the astonishing total of 45½ miles of line to its mainland system, and this year's plans call for the building of 64 miles.

The British Columbia Telephone Company has decided to modernize the New Westminster plant. Up-to-date telephones, a new switchboard and an improved exchange building are promised.

Following the lead of the telegraph companies in establishing a night letter rate, the British Columbia Telephone Company on August 1st instituted a cheap night telephone service between Vancouver and Victoria which is resuling in a great growth of business. The former toll was 50 cents per one minute and 10 cents each for each additional fifteen seconds; the new night rate is 50 cents for three minutes and 10 cents for each additional minute.

The Fort George and Alberta Telephone Company's new line from Blackwater, where connection is had with the government system of telegraphs, to Fort George, a distance of 55 miles, was recently completed and is said to be one of the best paying services in British Columbia.

The C.P.R. telegraph department is effecting great improvein its service to Kootenay points. To this end a new copper wire is being strung between Calgary and Nelson.

Mr. Lorne A. Campbell, managing director of the West Kootenay Power & Light Company, of Bonnington Falls, paid Vancouver a business visit recently. Mr. Campbell says the revival of mining in his destrict is making heavy demands on the company's available power after supplying the mines at Rossland and in the Boundary district.

New Books

The Watt-hour Meter—by William M. Shepard and Allen G. Jones—Technical Publishing Company, San Francisco. Price, $2.00 net. A description of the prominent types and the best usage of modern domestic watthour meters. The authors have made a very fair attempt to present a technical subject in such simple form as will appeal to the central station man, the practical meter man and the student alike, and the book will be found a useful guide in the proper installation, connection and maintenance of watthour meters. Illustrated.

Solenoids, Electromagnets and Electro-magnetic Windings—by Charles R. Underhill, associate member, A.I.E.E.—D. Van Nostrand Company, New York, publishers. Price, $2.00 net. The author has endeavored to describe the evolution of the solenoid and various other types of electromagnets in their natural order of development. This book will be welcomed alike by the electrical profession and the manufacturer of electrical apparatus, and will be of unusual value to the student, whether elementary or advanced. The book is well illustrated and well printed.

Electric Motors—by Francis B. Crocker, E.M. Ph.D., Professor of Electrical Engineering, Columbia University, and Morton Arendt, E.E., assistant professor—D. Van Nostrand Company, New York, publishers. Price, $2.50 net. A book dealing with the action, control and application of electric motors. The authors point out that while there is much literature extant on the design and contsruction of electric apparatus the subject of operation has received scant attention, an anomalous condition when one considers that for every designer of such apparatus there are hundreds of operators. The matter is treated more or less technically and is especially designed to interest electrical engineers who install or run electric power plants, or managers of manufacturing or other establishments in which electrical devices are employed. The book is clearly typed on good paper and fully illustrated.

The Makers of Electrical Canada—3

R. H. SPERLING—THE ENGINEER-MANAGER

Every citizen of British Columbia has cause to be proud of the record of the British Columbia Electric Railway Company, which has done much for the province by initiating and carrying out, without intermission, a tremendous scheme of expansion and improvement that has helped the accomplishment of great things by the people of Vancouver and Victoria, the chief cities, and their surrounding municipalities, by supplying their needs in the line of transportation, light and power. As the population of the province increased, other companies, encouraged by the success of the British Columbia Electric Railway Company, undertook the development of light and power plants and telephone systems in various parts of the interior, the result being that this dissemination of modern advantages and comforts attracted population to the Pacific province and, doubtless, induced settlement in districts which, deprived of these advantages, might have remained for years to come in a sparsely settled state.

Mr. R. H. Sperling

For the last decade the history of this almost incredible expansion has been in large measure the history of the subject of our sketch, R. H. Sperling, general manager of the British Columbia Electric Railway Company, who is one of the youngest men in Canada to-day at the head of an enterprise of like importance. English by birth, Mr. Sperling received his preparatory education at Eton College, and after leaving that famous institution of learning, obtained a thorough training as an electrical engineer, previous to coming to Canada in 1896. In that year he received the appointment of engineer for a mining company in British Columbia. In the following year he became associated with the British Columbia Electric Railway Company and served in various capacities until 1906, when his exceptional talents for management and administration of large affairs were recognized in his appointment to the position of general manager of the company.

In 1897 the British Columbia Electric Railway Company purchased the street railway and lighting companies operating in Vancouver and Victoria, and the Interurban Railway between Vancouver and New Westminster. The following statistics give some idea of the growth of the company's business during the intervening 12-year period:

	1897.	1909.
Passengers carried	3,000,000	33,500,000
Population served	60,000	175,000
Capital of company	£462,000	£3,500,000
Miles of track in operation and under construction	40	237

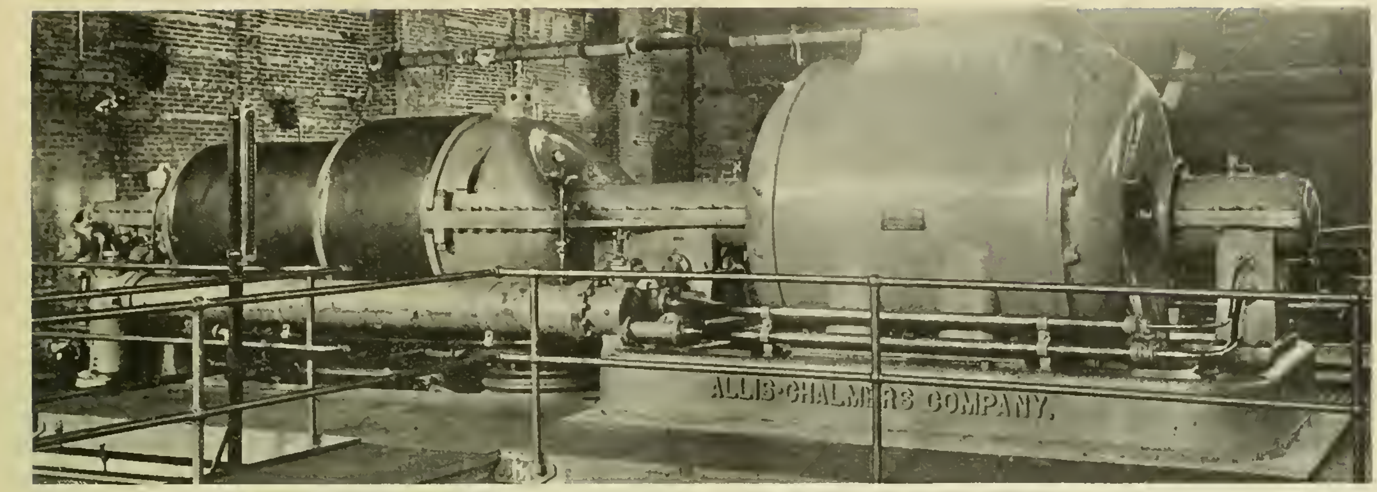
The above figures will show that the management has adopted an aggressive policy. Several years ago, the company also acquired the undertakings of the Vancouver and Victoria gas companies, and the history of the company will show a steady reduction in charges for gas and electric light and power. The company owns and operates a water power system near the city of Victoria, to supply its requirements, and is now developing an additional water power at the Jordan river, at a cost of $2,000,000. In Vancouver the company owns and operates a water power system with a present capacity of 33,000 h.p., which can be increased up to 52,000 h.p.

The company is also building an electric railway between New Westminster city and the town of Chilliwack, a distance of 63 miles, at a cost of $3,000,000. They have also taken over a branch of the C.P.R., 25 miles in length, and have converted it into an electric railway. Recent street railway plans also include large expenditures in Point Grey and vicinity.

During the year to June 30, 1910, the company expended over $5,000,000 in additions and extensions to its various undertakings, and in the year commencing July 1, 1910, the estimated expenditure will probably reach in the neighborhood of $7,000,000. Within the past few weeks the company has considered plans for the development of about 110,000 additional horse power for the needs of "Greater Vancouver," and the vastly extended interurban service of the future. The power would be secured from Jones' lake and Chilliwack lake, about 80 miles from Vancouver in a northeasterly direction. The development plans call for an outlay of about $10,000,000, spread over a period of about six years.

Few companies in the Dominion of Canada can show such a record of progress. At the end of the year 1909 the company's undertakings were more extensive than those of any other electric railway and lighting company in Canada, and the capital invested was the largest of any similar company in Canada.

Mr. Sperling, although still a young man, has shown marked executive ability in guiding the fortunes of the company which has shown such marvellous growth. Being an electrical engineer by profession, he is well qualified to take care of the engineering features which sometimes prove so troublesome to managers of public utility companies who have not had the advantages of a technical training. Mr. Sperling also has an enviable reputation for popularity amongst all classes with whom he comes in touch, and has always taken a broad interest in all public charities. In private life, of which, indeed, he has little, he is fond of sport and takes the keenest delight in a few stolen hours of fishing or shooting.



2000 K. W. Steam Turbo-Generator—B. C. E. R. Company's Auxiliary Plant

Auxiliary Steam Plant of B. C. E. Ry. Co.

New Steam Turbines to Develop 6000 Horse Power — Operate in Parallel with the Hydro-Electric Plant—A Record Installation—Smoke Stack 240 Feet High

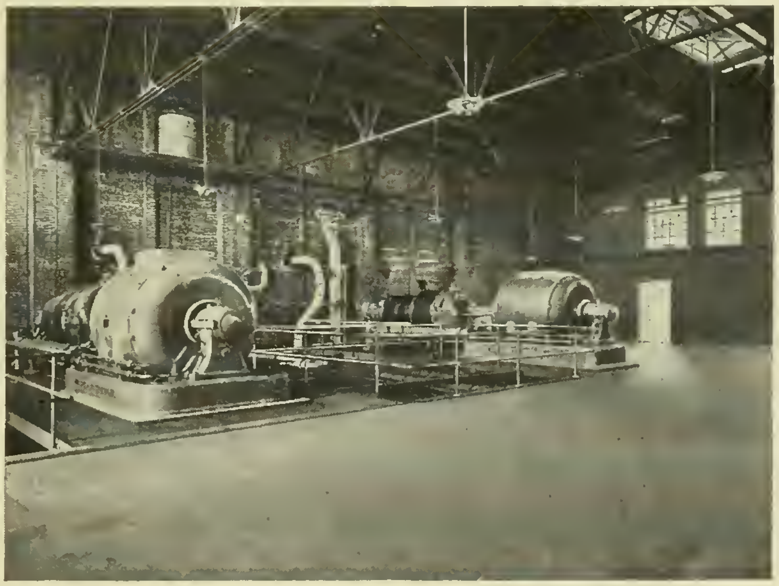
Owing to the extremely rapid growth of the load on the Lake Buntzen power plant of the British Columbia Electric Railway, which surpassed all expectations, it was decided early last December to immediately construct a 6,000 h.p. steam auxiliary power plant in Vancouver. As time was of the utmost importance, this fact was emphasized in awarding the contracts, and it is believed that a record was achieved in bringing this plant to completion. The official contracts for the entire equipment was signed between Christmas and New Year's last, and inside of five months everything was in place and the steam turbines were started up and placed in parallel with the water power plant.

The building is a substantial brick structure located on Barnard street, just west of Westminster avenue, and was originally erected for and used as a steam station before the Lake Buntzen hydro-electric plant was built. Part of the building only is occupied by the new plant, leaving ample room for future extension if necessary.

The boiler room has been entirely rebuilt and is fitted with large bunker overhead, fed from the coal dock by a motor-driven Robins coal conveyor. The boiler plant comprises six 1,000 h.p. Babcock & Wilcox Scotch boilers fitted with B. & W. chain-grate stokers. There is an ash conveyor under the boilers. The stack is a Weber patented reinforced concrete one, 11 feet inside diameter, and 240 feet high, placing it among the tall chimneys of the Dominion. The boiler plant, stack and auxiliary pumps were installed by C. C. Moore & Company, of San Francisco; the coal bunkers were constructed by B. C. E. R. Company workmen.

Electric power is supplied by two Allis-Chalmers Company, 2,000 k.w., 1,800 r.p.m., turbo-generators, 3-phase, 60-cycle, installed by the Allis-Chalmers-Bullock Company, of Montreal, through their Vancouver office. The exciter is a 75 k.w. machine, direct-connected to a Robb-Armstrong side-crank engine.

The auxiliary plant is equipped with Wheeler condensers, feed pumps and heaters, water being obtained from the harbor by two centrifugal pumps, direct driven by two Allis-Chalmers-Bullock 50 h.p. motors.



General View of Power House—B. C. E. R. Auxiliary Plant

The switchboard is a substantial one of six panels, fitted with best instruments and oil switches, also a General Electric automatic voltage regulator. The machines are synchronized on the switchboard busses, and through a main switch directly on the 2,500-volt bus-bars in the sub-station at Lake Buntzen.

It is of notable interest in connection with steam turbine work that the two Allis-Chalmers turbo-generators above mentioned, were placed in commission from the first hour they were started up, and they have been carrying continuously from 10 to 25 per cent. overload since that time, operating at one run for 38 days and nights without being shut down, since which time they have again been in operation continuously. This record is particularly remarkable in view of the large size of the units, the boiler capacity being divided into 1,000 h.p. units and the steam turbines being each 3,000 actual horsepower capacity. The two accompanying photographs indicate the general appearance of the interior.

Electric Power in and around Cobalt

A Modern Interurban Railway—A Cleverly Designed Hydraulic Compressed Air Plant—Two Large Hydro-Electric Generating Systems

The Cobalt area is a little world by itself. Accustomed as we are to consider North Bay as the extreme northern boundary of Ontario's fertile lands, one enters with some misgivings that rocky, sparsely wooded and more sparsely populated stretch of land through which one must pass to reach the northern silver town. The early part of the journey is monotonous enough, and it is not until one reaches the Temagami district, with its pretty lakes and restful islands, that one realizes that a great divide has been passed and that a second Ontario, rich alike in beauty and wealth, is gradually unfolding itself.

Of the Cobalt area itself it would, perhaps, not be exactly correct to say that beauty is a striking characteristic, but the wealth undoubtedly is there, and for the present, intense activity must be the excuse for unprepossessing appearances. Improvements in the town itself, however, are greatly in evidence and under such adverse circumstances too as would discourage many an older and larger centre. It may, for example, appear a minor matter to state that the town is installing a complete underground water and sewage system. In actual fact, however, the big trenches, ranging in many places from twelve to twenty feet in depth, are being blasted from one end of the town to the other, out of solid rock.

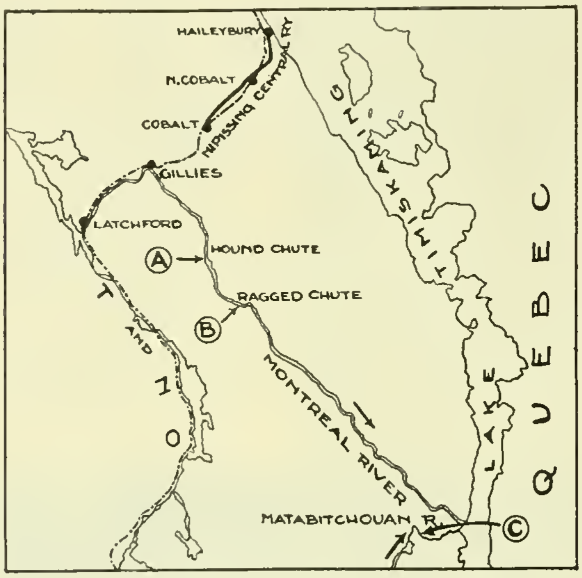


Fig. 1—Map of Cobalt's Electrical Area

The town and neighborhood of Cobalt are also strikingly abreast of modern times in the possession and general use of electric light and power. It is, of course, impossible to say just what portion of the prosperity of this district is directly attributable to the presence of this modern necessity, but it is safe to say that Cobalt's progress, past and present, would have been unspeakably retarded and the future prospects be much less roseate if nature had not thoughtfully supplied in addition to wealth of minerals, a wealth of waterfalls as well, amply sufficient, at comparatively small expense, to provide light and power in various forms, not only to the towns, but to every mining or other industry in the neighborhood.

The four examples which, to the electrical eye, stand out prominently in the Cobalt region are (1) an up-to-date interurban electric railway, the Nipissing Central; (2) the hydro-electric development of the Beach Brothers, some six miles from Cobalt town at Hound Chutes on the Montreal river, operating under the name of the Cobalt Power Company; (3) a hydraulic compressed air system, operated by the Cobalt Hydraulic Company and situated on the Montreal river, a little lower down, at Ragged Chutes; and (4) the hydro-electric development near the mouth of the Montreal river, but situated on the Matabitchouan, a smaller river, emptying into Lake Temiskaming at practically the same point on the Montreal river. This latter is known as the Mines' Power Company. In Fig. 1 the general layout of the Cobalt area with reference to the above electrical enterprises, is shown. The path of the railway is fairly indicated. At A is the hydro-electric installation of the Cobalt Power Company; at B the compressed air plant, and at C the Mines' Power Company's hydro-electric plant.

The Nipissing Central Railway.

The Nipissing Central operates, since May 1st of the present year, about four miles of railway, connecting Cobalt and Haileybury towns. Half-hour service is given between these towns at all hours of the day and at certain hours a quarter-hour service. For the mid-day service two coaches are sufficient, but in the rush hours four cars are operated. The business-like management of this road is a distinct and very pleasant surprise to the traveller who has grown accustomed to the indifferent service so often rendered by smaller towns. The roadbed compares favorably with any to be found in interurban traffic in older Ontario, and the schedule is strictly adhered to. A straight 10-cent fare is charged each way. An extension of the line is already contemplated to New Liskeard, and to Kerr Lake, each distant about five miles. Mr. J. W. Fitzpatrick is president of the company.

The cars in use on this railway were constructed by the Preston Car & Coach Company. (See Fig. 2.) The cars are 45 feet long over all. They are finished in red birch, with cross seats and centre aisles. The seats are upholstered in spring rattan. They are equipped with basket racks and electric heaters. The trucks used are Bemis No. 45. The electrical equipment is a quadruple G. E. 80 with double end control. The air brakes are Westinghouse A. M. M. The underframe of the car body is steel throughout. The cars are painted Pullman color with gold trimmings on the outside.

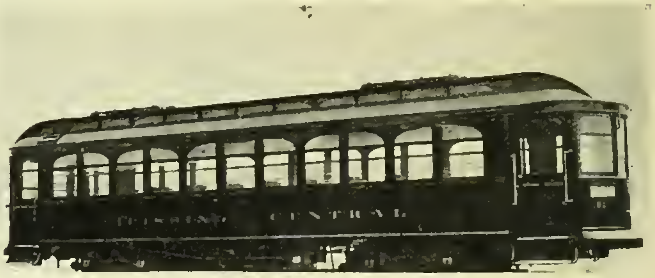


Fig. 2—Car Built by Preston Coach & Car Company for Nipissing Central Railway

The Cobalt Hydraulic Company.

This plant transmits compressed air from Ragged Chutes to Cobalt town and district, a distance of about eleven miles. The air is carried in a metal tube, a view of which is shown in Fig. 3. This tube is eighteen inches inside diameter. The pressure at the chutes is 120 pounds, which, delivered at the mines, gives something over 100 pounds to the square inch. The capacity of the plant at the air intake is 40,000 cubic feet of air per minute designed to deliver 5,000 cubic feet per minute under 100 pounds pressure at the mines..

The diagram shown in Fig 4, will give the reader a reasonable idea of the plan under which the plant operates. While the underlying principle is as old as the world itself, its application to this form of industrial enterprise is entirely new, and too much praise cannot be given the clever inventor, Mr. C. H. Taylor, who is also the superintendent at present in charge of the system. And not only the plant itself, but everything connected with it, including a complete workshop, where apparatus to meet the special requirements of such a plant, meters, etc., not purchasable in the open market, are being designed and manufactured, speaks of the genius of the man in charge.

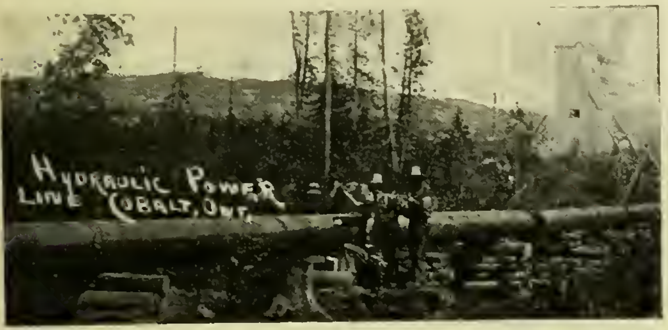


Fig. 3—Metal Tube Conducting Compressed Air Eleven Miles under 120 Pounds Pressure

The huge shafts and tunnel are all sunk in the solid rock. The upper end of the intake vertical shaft, shown on the left side of Fig. 4, is closed except for some dozen large circular perforations, and resembles more than anything else, the outlet of an ordinary water sink. This perforated end is kept at such a distance below the surface of the water as is best suited to the proper mixture, by suction, of the air and water; this distance is about 14 inches. The mixture is now carried down the 350-foot vertical shaft in the same way as in a filter pump, but as soon as the bottom is reached and the mixture begins its course along the horizontal 1,000-foot tunnel, the water settles to the bottom and the air escapes upward to the reservoir, where it is held under pressure and from which it can only escape through the pipe line or the exhaust (when the demand is less than the supply). On a day when the mines are not using power, which happened to be the case when the writer visited this plant a few weeks ago, the discharge of air from the exhaust, carrying with it a considerable quantity of spray, is a most wonderful sight, a stream of spray being thrown between one and two hundred feet straight up into the air.

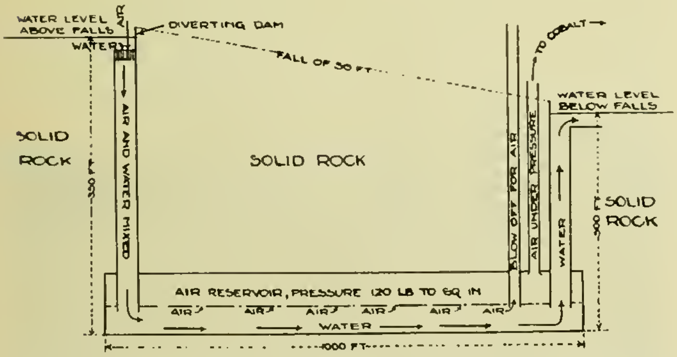


Fig. 4—Diagrammatic Sketch of Hydro-Electric Air Compressing Plant—Cobalt Hydraulic Company

The Mines' Power Installation.

Mr. A. E. Walberg, of Montreal, is largely interested in this plant which has been constructed by the engineering firm of Smith, Kerry & Chace. The generating station is situated some twenty-six miles south of Cobalt on the Matabitchouan river, as shown in Fig. 1. From there the electric power is transmitted to substations in Cobalt, Brady Lake and South Lorraine. The site of the power house is two and one-half miles from the point where the Matabitchouan river enters Lake Temiskaming. The location was most favorable for getting full benefit of the total fall of water at minimum cost. As seen in Figs. 1 and 5, the Matabitchouan takes a sudden curve at the point marked "C," Fig. 1, and doubles back on itself in the short distance of a mile or less. All around this sharp curve was formerly falls and rapids, giving a total head of over 300 feet. The plan of utilization of this fall consisted simply in the construction of a diverting dam at the head of the rapids, Fig. 5, and the leading of the diverted water over the steep hill side by the shortest route to the river bed below.

The work was commenced in June, 1909, and in March, 1910, the plant was in operation and supplying power to the mines The material for building was brought to the grounds by way of Temiskaming, and from there by scows up Lake Temiskaming and the Matabitchouan river to within 500 yards of the power house. All of the machines to be installed and most of the material was placed on the grounds before navigation closed and the remainder was hauled by teams over the chain of lakes from Temagami.

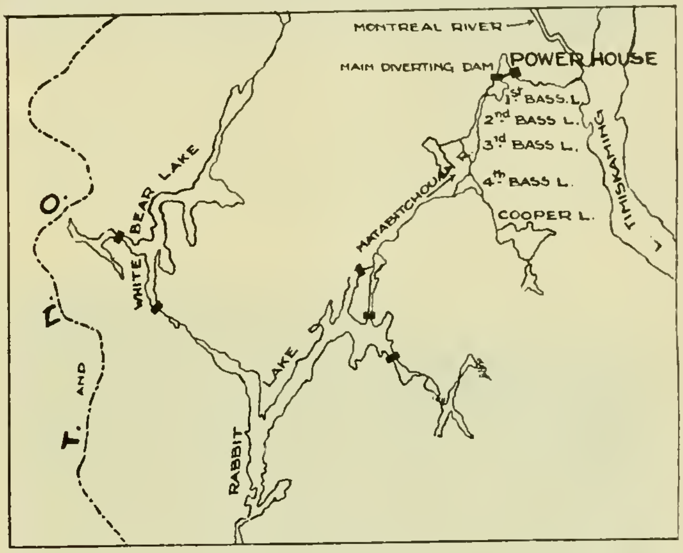


Fig. 5 - Storage System Showing Numerous Lakes and Dams

The Storage System.

The storage system is an extensive one, developed to a degree quite in excess of what has previously been considered necessary in Canadian plants, and is, further, along lines in conformity with the modern ideas of the necessity of the conservation of our natural resources. The Matabitchouan river in its natural flow varied greatly with the seasons. Possibly at lowest water not more than 2,000 horse power would have been assured. By the judicious damming of a chain or group of small lakes, which are dotted over the drainage area, all the water of the spring freshets can be stored in the various reservoirs. These dams will be opened one by one as demand requires them and a constant supply of approximately 8,000 horse power delivered to the turbines.

The drainage area now controlled by this series of dams, is about 350 square miles. Figure 5 will give an accurate idea of the extent and completeness of the storage system.

The water in First, Second and Third Bass Lakes has been raised 40 feet by the main dam. Three dams have been built to hold the water in Rabbit Lake, which can be raised 13 feet and has an area of about 7 square miles. Above this lake is White Bear, in which the water can be raised 10 feet. In addition to these there are dams at Ross and Bear Lakes, but both of these belong to lumber companies.

The main diverting dam near the power house, Figs. 5 and 6, is approximately 675 feet long and built of concrete. It has three waste sluices, each 14 feet long, and one log sluice 20 feet long, and a spillway of 30 feet.

The Pipe Lines.

There are two pipe lines each 1,054 feet long and 5 feet in diameter, installed by the Jenckes Machine Company, of St. Catharines. The pipes (Fig. 7) are supported by three concrete anchor blocks, and have concrete saddles at intervals of 12 feet. Each pipe has four expansion joints. A bursting plate and manhole are also installed at the foot of each. There is a net head of 312 feet, which gives a pressure of 126 pounds in the wheel case.

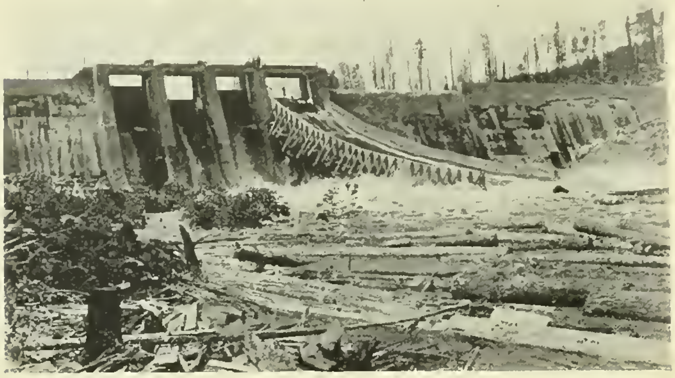


Fig 6—Diverting Dam—Mines Power Company

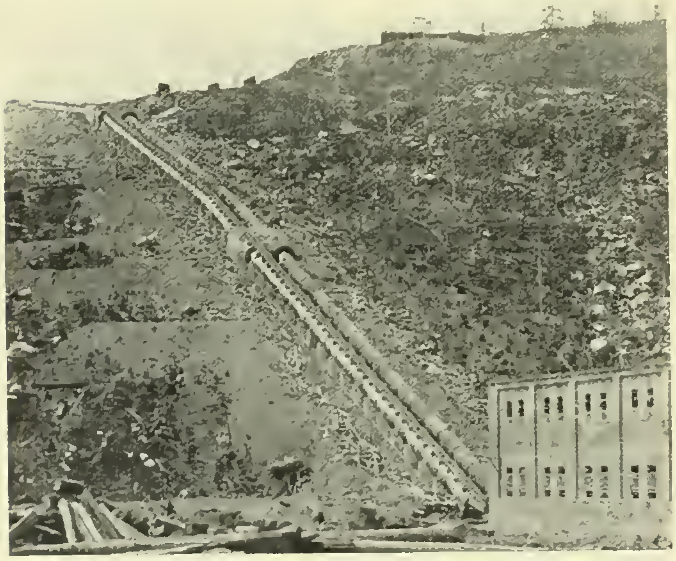


Fig. 7—Two Pipe Lines—312 Foot Fall

The Power House.

The power house, Fig. 8, contains four turbines with a maximum of 2,750 horse power each, and a normal rating of 2,150 horse power. These are direct connected to four generators, each 1,875 k.v.a., 2,400 volts, 60-cycle, 3-phase, 600 r.p.m. Each of the four turbine units also carries a cast steel fly-wheel of 8,000 pounds for speed regulation. Fig. 9 shows the complete installation of turbines, generators, 8,000-pound fly-wheels, governors and switchboard. A single complete unit is better seen in Fig. 10, which also shows the system of inclosed arc illumination used in the power house. Two generators and one exciter turbine are taken off each pipe line. Each turbine is fitted with a 25-inch gate valve to shut the water out of the wheel case. The turbines are single-runner wheels with side discharge. Each exciter (there are two) has a rating of 100 k.w., 800-ampere, 120-125-volts, which is sufficient to excite all four generators. The turbines, generators and exciters were installed by the Allis-Chalmers Company, of Montreal.

Each of the four water wheels has its own governor manufactured by the Jens Orten-Boving Company, of Sweden, and installed by the recently incorporated Canadian Boving Company. They are of the R.M.O. type.

The transformers, switchboard, oil switches, lightning arresters, and battery were installed by the Canadian Westinghouse Company, of Hamilton. The transformers are 3-phase, 60-cycle, 1,875 k.v.a., 2,400-44,000-volt, oil and water cooled. Each transformer has an oil switch on the low tension side with overload relays and knife switches to disconnect from the H. T. bus-bars. A transformer can be taken out of service at any time without unbalancing the system.

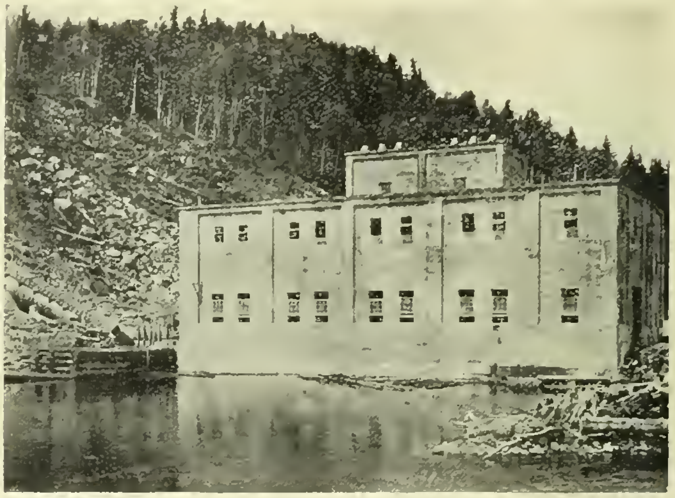


Fig. 8—Exterior of Power House—Mines Power Company

Westinghouse G. A. 44,000 oil circuit-breakers are on each line and equipped with an overload relay. The high tension bus-bars are also connected by a G.A. circuit-breaker as tie switch. The sub-stations are equipped with overload and reverse current relays on each line. In operating both transmission lines are operated in parallel, but not connected as the tie switch on the high tention bus-bars is left open. By operating in this way with the overload relays at the power house and reverse current relays at the sub-stations a line having trouble will automatically trip and the other line will carry the load without interruption. By closing the tie switch all the transformers can be put on one line.

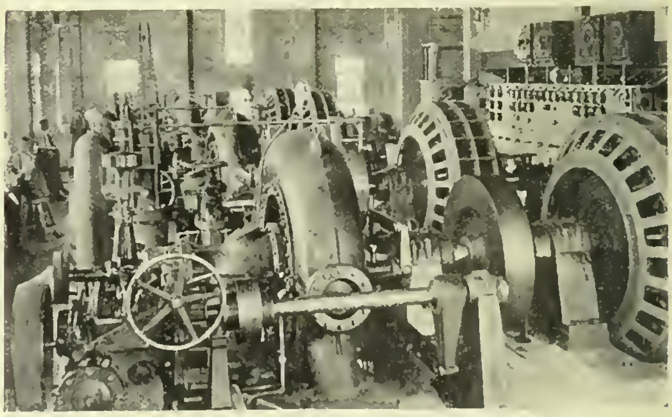


Fig. 9—Interior Power House—Mines Power Company

The Westinghouse electrolytic lightning arresters are placed in the upper tower. The lines leave the power house through the roof by means of the roof insulator built by the Locke Insulator Company. These are only in use in one other system in

Canada. There are twelve insulators mounted on concrete cones. Through six of these the main lines pass, and through the other six the lines pass to the electrolytic cells in the room beneath. The horn gaps are placed outside on the roof, and can be opened and closed from the arrester room by means of wire cords. This gives a simple and easy method of charging the electrolytic cells, which is done every two weeks.

A storage battery has also been installed in the power house for emergency requirements. It has a capacity of 80 ampere hours, which furnishes power for the electrically-operated switches and also furnishes light in the event of trouble on the system. The power house is also equipped with a 12-ton crane supplied by the Whiting Foundry Equipment Company.

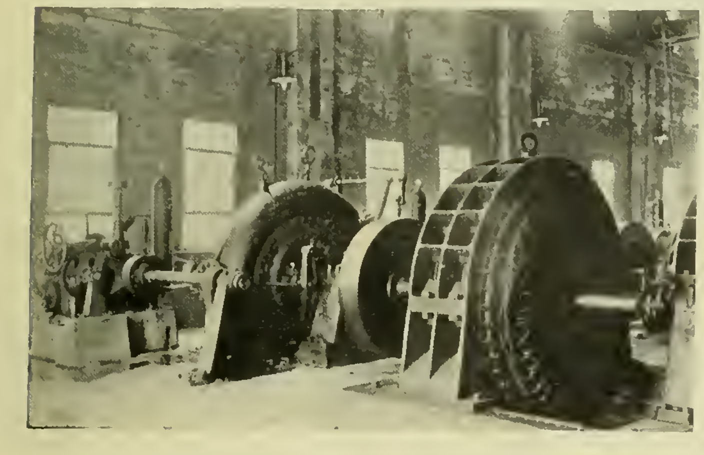


Fig. 10—Single Unit Showing Generator, Turbine, 4 Ton Regulator, Governor and System of Lighting

The Transmission Line.

The transmission line is twenty-six miles long. It is a two-pole line of No. 0 aluminium cable. A ground line runs the entire length on the tops of the poles and is grounded at regular intervals. The telephone line runs along one of the transmission pole lines and is transposed at every third pole. A telephone transformer is placed at each station to remove any induction from the high voltage lines.

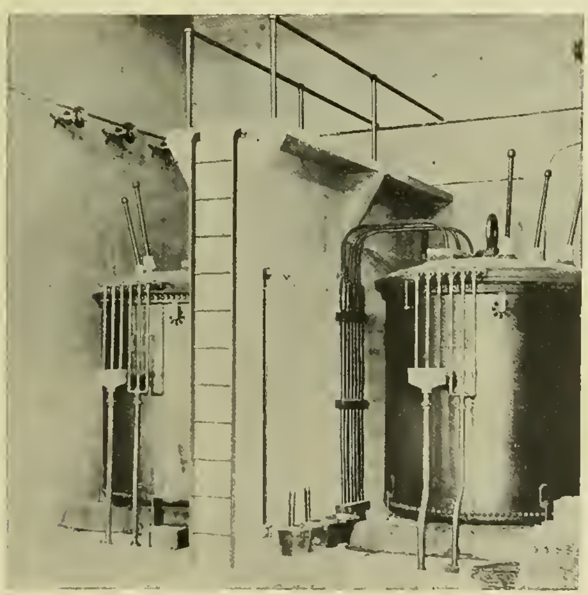


Fig. 11—Transformers—Mines Power Company

The Mines Power plant is operated under the able superintendence of Mr. A. R. Webster, to whose kindness we are greatly indebted for much information contained in the above descriptions. Mr. Webster is a graduate of the Electrical Engineering Department of Queen's University, and was further schooled by the Canadian General Electric Company for some year and a half. Later, the Western Electric Company, of Chicago, secured his services, but in 1907, naturally liking Canada better, he moved back to Montreal as assistant superintendent of the Montreal station of the Shawinigan Water & Power Company. In January of the current year, he left Montreal for his present position. It is safe to say that, in a large measure, the satisfaction which customers are expressing with the Mines Power Company's service is due to the skilful, constant watchfulness of its well-trained superintendent.

(To be continued—Our next issue will contain a description of the Cobalt Power Company's plant and various substations in the neighborhood.)

The Poet's Corner

A well-known Canadian, travelling in the British Isles, sends us the following: Recently a rather serious accident happened in the generating station of a large hydro-electric installation, resulting in the burn-out of the armatures of two or three generators. The affair so raised the temperature of the poet of the plant that he boiled over and spilled upon the ground the following effusion:

As several useful hints came out during the spasm, it might be well for you to publish them in the interests of your readers.

Hints For Operators.

If the lightning strikes the line, pull the field switch,
If the plant is running fine, pull the field switch,
If the tie switch won't untie, or the volts lie down and die,
Or the flywheel starts to fly, pull the field switch.

If the wattmeters won't watt, pull the field switch,
If the bearings get red hot, pull the field switch,
If the governor starts to race, or the turbine busts its case,
Or you do not like the place, pull the field switch.

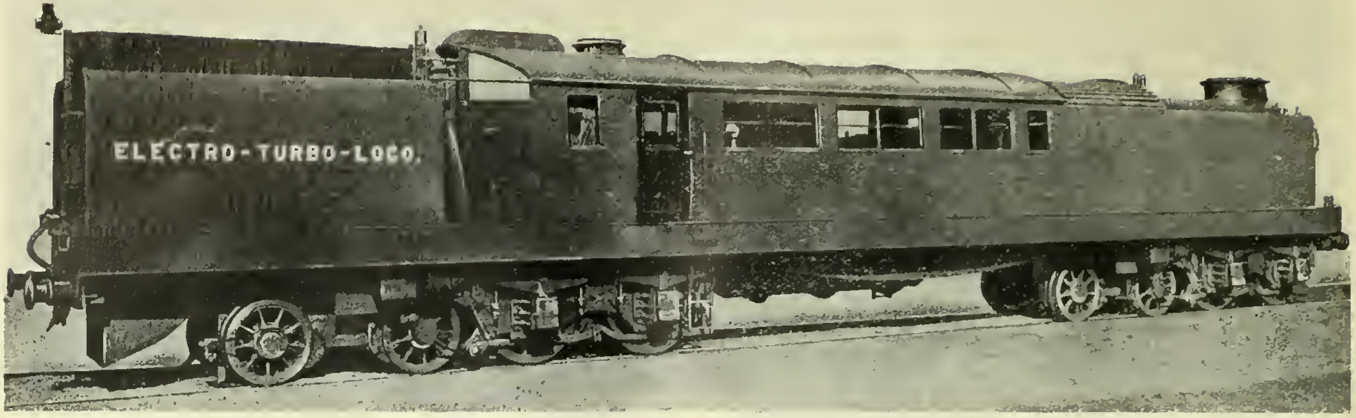
If the switchboard gets on fire, pull the field switch,
If the office you require, pull the field switch,
If you've rung them till you're sore, just come out and close the door,
And, as I remarked before, pull the field switch.

If the wheelman cracks a joke, pull the field switch,
If the choke coils go and choke, pull the field switch,
If the field ammeter shunts start doing funny stunts,
And the generator grunts, pull the field switch.

If things begin to rip, pull the field switch,
If you hear a sound like "Zip," pull the field switch,
If an armature burns out, to fly is safest, without doubt,
But,—before you run and shout, pull the field switch.

A Record in Power Equipment

Bellis & Morcom, of Birmingham, England, have issued a little booklet entitled "A Record in Power House Equipment," describing the installation and continuous operation of two of their 500 k.w. engine sets in the Johannesburg corporation electric generating station within six weeks of the placing of the order. This is particularly noteworthy in view of the fact that one of the engines had to be ordered from England. A further installation of a third 500 k.w. set and three 1,000 k.w. sets, were also completed within twenty months of the placing of the first order. A still more recent order for a 5,000 h.p. turbine steam engine is now in hand.



The New Glasgow Locomotive, including a Steam Boiler, Steam Turbine, Electric Dynamo and four Electric Motors.

Recent Electric Railway Progress

New Steam Turbine Electric Locomotive

In a recent issue we mentioned a novel locomotive under construction in Glasgow which would utilize steam generated in the ordinary way to drive a turbine of the impulse type at the rate of 3,000 revolutions per minute, which would in turn operate an electric generator to supply motive power for the operation of the locomotive.

The current issue of "The Engineer" prints a photograph of the completed engine, which we reproduce. It appears that the construction is sufficiently advanced for trial trips which have proven very satisfactory. It will be recalled that the dynamo supplies current to four series-wound traction motors of which the armatures are built right on the four main driving axles of the locomotive. The generator is also direct coupled to the turbine showing that compactness has been considered an important factor. Data regarding the actual operation of the locomotive under normal load conditions will soon be available.

The Edison-Beach Storage Battery Experiment

The Edison-Beach car installed on the Twenty-eighth and Twenty-ninth Street Crosstown Railroad, New York City, has now been in operation since the first of the year and under continuous test most of the time. Up to the present date the car has run more han 10,000 miles on the worst kind of track and in all kinds of weather. During this period there have been no repairs to the car or battery except the renewal of one motor brush and the addition of 70 gallons of water to the battery. Each battery is changed once a day, and the car will then operate 86 miles. The changing period of the battery is 4.4 hours at 185 volts and 60 amperes. The weight of the car when loaded is about 12,500 pounds. Each car is equipped with 100 cells. It has been shown that the average energy consumption per ton-mile, based on battery intake, is 137 watt hours..

Thirty New Storage Battery Cars in New York

The Electric Railway Journal of July 23rd publishes a description of one of the new cars to be used on the Third Avenue Railway in New York City (now using horse cars), which will be operated by "Gould" storage batteries. The experiment was tried early in the present year by equipping one of the old horse cars with batteries, and this pioneer car has proved so successful that an order has been placed for 30 more—25 of which will be new cars. The contract with the battery company calls for the maintenance of the accumulators for five years at a fixed rate per car mile. They agree to do all necessary cleaning, furnish all renewals, make repairs and generally maintain the efficiency of the cells in good operating condition.

The battery equipment of each car will consist of 58 cells with a capacity of 420 ampere hours, when discharged at a 70-ampere rate. The motor equipment for each car will consist of two G. E. automobile type motors, rated 30-ampere capacity at 125 volts. The total weight of the car body, truck and equipment will be about six tons. The streets are practically level and a regular schedule of seven miles per hour, figuring on eight stops to the mile, will be maintained.

The Adverse Report of the "Committee of Fifty"

The report of the "committee of fifty" appointed to investigate the street railway conditions in and around Detroit, where, it will be remembered, many of the franchises recently expired and have not been renewed, has been handed in. The matter, as a whole, is not of great value to Canadians, but the report of the special committee on "Extensions and Re-arrangements," which deals chiefly with the question of municipal ownership and operation of the system, is of very general interest, and, although it applies specially to this one city, is applicable in many of its arguments to any utility in any town or city. The report, which is unfavorable to such ownership, follows in part:

"Before any municipal undertaking may be classed as successful, two facts must be established to the satisfaction of the taxpayers.

"(1) Would a rigid system of accounting, with every legitimate expense charged to the utility operated rather than to some general fund, with proper allowance for interest on the investment, depreciation, obsolescence and sinking fund leave a balance upon the right side of the municipal ledger?

"(2) Is the standard of operation, service, wages and general up-keep such that it would be satisfactory to the people of an American city?

"Comparison of existing municipal street railway undertakings in foreign cities being found of little value for the purpose of our investigation, your committee has considered the subject under the following heads:

"(1) What will municipal ownership of the street railways of Detroit cost?

"(2) Can Detroit afford to make the investment?

"(3) Is it desirable to assume the burden; to assume the responsibility of a costly experiment with no definite assurance that cheaper fare could be provided without affecting the quality of service?

"As the franchises of the Detroit United Railway, which expired on November 14th, 1909, covered only a part of the city system, unless an advantageous purchase of the remaining lines can be made by the city, municipal ownership can be only partial for at least fourteen years, at least not unless the city shall engage in a costly work of paralleling such lines. Two systems would mean two fares in many cases now covered by transfer.

"In Detroit the amount which the municipalization of the street railway system would require would, when added to the present bonded debt, so largely increase the percentage of bonded debt to taxable property as to exclude the bonds from savings banks' investment.

"As a municipality we are seemingly pushed to the limit of our resources to perform such primary, non-contentious municipal undertakings as, having no element of profit in them, cannot be left to private enterprise. Do taxpayers desire to assume the responsibility in the hope of securing cheaper transportation?

"By placing the street railway system under municipal control a large body of municipal employees is created, each member having a vote. The management is made to reside in a body politic, subject to change at least every two years. Do these conditions indicate a fair probability that such efficiency and economy in administration and operation will prevail as will serve to reduce fares in a sufficiently large degree to warrant and render advisable pledging the faith and credit of the city; increasing the bonded debt and tax rate?

"No one will claim that an intricate business like the operation of a great railway system should be left to the decisions of bodies of men inexperienced in the particular problems involved. Men competent to make profits cannot afford to give their services to secure profits for a city. Nor is the management of a street railway calculated to draw men into the service for the sake of honor, since the occupation is beset with difficulties and anxieties. Responsibility for life and property is in the highest degree burdensome, and the dealings with an army of employees on the one hand and with the public on the other require tact and experience, which command a high price in the labor market.

"With profit to the individual as an incentive to economy in administration eliminated; with our municipalities as at present organized, tenure of office brief and with politics entering so largely into municipal elections, it is a matter of grave doubt in the minds of your committee as to whether the conduct of an undertaking requiring experience for efficient management, could be operated by the municipality to the profit either of the taxpayer or the car patron.

"Summing up the situation as it exists in Detroit to-day, your committee believes that the municipal ownership of street railways at the present time would:

"(1) Largely increase the city's bonded debt.

"(2) Increase the tax rate.

"(3) Diminish the amount of taxable property.

"(4) Increase the city's liability for damage claims.

"(5) Benefit neither taxpayer, employee nor patron.

"(6) So increase the tax rate as to react to the detriment of the city's industrial expansion.

"(7) Promote increased political manipulation.

"We believe that for Detroit to engage in street railway operation would be to enter a field better adapted to private than public undertaking, to enter upon an experiment certain to be costly and not certain to be successful, a course most unwise, from a business standpoint and which, in the opinion of your committee, should not be undertaken."

Personal Mention

Mr. John Halliday, superintendent of the Bell Telephone System for the Coaticook, Que., district, left recently to assume the duties in his new district at Cowansville. His successor is Mr. Lowe, formerly of Sherbrooke.

Mr. A. B. Anderson, manager and president of Ferranti, Limited, head office Lancashire, England, is on a trip across Canada. Mr. Anderson expressed himself as well pleased with Canadian conditions and business prospects. This company already has a number of agencies west of Toronto and anticipates the necessity of establishing others in Eastern Canada at an early date.

Mr. Frank Koester, of New York, in an important paper presented before the recent convention of the Society for the Promotion of Engineering Education, held at Madison, Wisconsin, discussed in detail the educational system of the German technical universities. He also analyzed the conditions and standing of the German engineer as compared with our own.

Mr. A. B. Lambe, jr., has resigned as manager of the Winnipeg office of the Canadian General Electric Company to accept an important position in the electrical inspection branch of the Inland Revenue Department, Ottawa, and has already assumed his new duties. He spent a couple of days in Toronto en route for his new field of labor. The Department is to be congratulated in securing Mr. Lambe's services.

Mr. Leonard Andrews, managing director of the Key Engineering Company, London, England, was one of the active participants in the discussions at the recent convention of the Canadian Electrical Association in Muskoka. Mr. Andrews is exceptionally well informed on electrical matters in England, and his remarks were greatly appreciated. Accompanied by Mrs. Andrews, he is making a tour of the world, combining business and pleasure. Like others of our friends from the British Isles, he was much impressed by the magnitude of Canada's resources, and greatly interested in our water developments and long-distance transmissions.

The "Electrical News" regrets to record the death of Dr. J. K. Johnstone, which occurred suddenly at his home in Toronto on the 12th ultimo. Dr. Johnstone was for years in charge of the gas and electric light inspection of the Inland Revenue Department at Toronto. He was a long-time member of the Canadian Electrical Association.

The D. P. Battery Company, of Bakewell, England, writes us as follows: "In reference to the recent meeting of mining engineers just held in London, when a statement was made that storage batteries entailed the attention of a highly skilled engineer; although such services are admittedly desirable in the case of a large central station installation, it is estimated that in fully 95 per cent. of our small installations, batteries are in use without skilled attention, with excellent results, as the working directions issued by the D. P. Company are simple and capable of being easily carried out. Wherever desired the company's expert staff will from time to time inspect any of their installations."

The Northumberland-Durham Power Company has sold its property at Healy Falls to the Seymour Power & Electric Company, which the latter proposes to develop within the next couple of years, the date depending on the completion of the Government work on the canal and dam there. About 15,000 horse-power, is available at this point, operating under a 76-foot head.

Mr. George Westinghouse, until recently president of the Westinghouse Electric & Manufacturing Company, has resigned and the office been taken by Mr. Edwin F. Atkins, of Boston.

Edmonton Municipal Telephone System

Automatic Plan of Central Exchange now in Operation—Rapid Growth, Excellent Service and Lower Cost—A Popular Discription of a Technical Plant

Municipal telephony at Edmonton, Alta., dates from January 1st, 1905, when the system in that city was purchased from a local company for the sum of $14,000. At that time the system comprised 450 telephones on single-grounded iron circuits and furnished a most inefficient service. The rates charged to subscribers were: For business telephones, $35 per annum and for residence telephones, $25 per annum. The subscribers had no long distance connection, that service being limited to one pay station telephone at the terminus of the Bell Telephone Company's line, to which all persons were under the necessity of journeying in order to secure outside communication. About the time of the transfer of the system to the city, the Bell Telephone Company was negotiating for its purchase, and it has been stated that adoption of municipal ownership was due to a strong objection on the part of the people to permit this company to control the local telephone service. How far the action of the civic authorities has been justified may be gleaned from the following particulars regarding the system at this date.

Edmonton's New Municipal Telephone Building

Under municipal management the outside plant was entirely reconstructed and with the exception of the subscribers distributing wires it is now almost entirely underground. The system is metallic circuit throughout, standard lead covered and paper insulated cables being used on all the main leads, and in point of efficiency the construction is of a type equal to anything upon this continent.

In 1907 the system having out-grown the capacity of its central office and its then existing manual switchboard, the council decided to instal an automatic system thereby dispensing with the necessity of the "Hello Girl" who by reason of the phenomenal prosperity of the city and the resultant high cost of labor was becoming an expensive item in the telephone business. A contract was placed with the Automatic Electric Company, of Chicago, owner of what is known as the "Strowger" system, for a central exchange plant having a capacity of 1,000 telephones. A new central office building was erected for its reception in the interval, and the automatic system was completed in June, 1908. Since that date the central exchange plant has been extended, five times, the present capacity allowing for 2,500 direct lines. The Edmonton system is on the three-wire principle, i.e., the impulses from the subscribers' stations to the central switch are sent over either one side or the other of the two-wire metallic circuit and the ground. The system works in conjunction with a similar system operated by the Alberta government at Strathcona, three miles distant, there being twenty-six trunk circuits between the two cities. The staff required for the maintenance of the Edmonton automatic system, including the subscribers' telephones, consists of a chief switchman, wire chief, assistant switchman, two instrument inspectors, a nightman, and two information operators. The cost of the central station equipment averages $29.42 per telephone installed.

On April 21st last there were on the Edmonton system 1,000 business and 1,100 residence telephones; the rates being $30 per annum for the former and $20 for the latter class of service. Other rates in force, per annum, are: For a desk in lieu of wall phone, $3.00 additional; business extension wall telephones, $10 for the first and $4 for each subsequent extension; business extension desk telephones, $13 for the first, $6.50 for the second, and $5 for each subsequent extension; residence extension wall 'phones, $7.50 for the first and $4.00 for each subsequent extension; residence extension desk telephones, $10.50 for the first and $5 for each subsequent extension.

The financial report for the year ending October 31st last, shows the capital expenditure to be $260,076. The revenue for the year was $39,600, which after deducting $17,561 for operation and maintenance, and $15,375 for interest, redemption and exchange, left a surplus of $6,664. The net surplus to date was $14,577. The sum of $36,543 had been written off the plant to date for depreciation.

The following description of the "Strowger" automatic system as installed at Edmonton is reprinted in part from a recent paper read before the Franklin Institute by Mr. W. Lee Campbell:—

While an automatic switchboard is a very complicated-looking piece of apparatus, its functions are not difficult to understand. Every telephone in each of our large cities is connected to the central office by a "line" which consists of a pair of wires. For the purpose of conversation between any two subscribers it is necessary that the terminals of their lines should be connected together for the time. When conversation is completed, the two lines should be promptly disconnected.

Main Street of Edmonton. Note the Absence of Poles, all Wires Being Underground Street Lights Carried on St. Ry. Poles.

In order to operate the mechanisms of the automatic switchboard to make and break these connections, it is necesary to send electrical impulses over the lines which extend from each telephone to the central exchange. As with the manual telephone, these lines consist only of the two required to complete the metallic electrical circuit necessary for successful and satisfactory conversation.

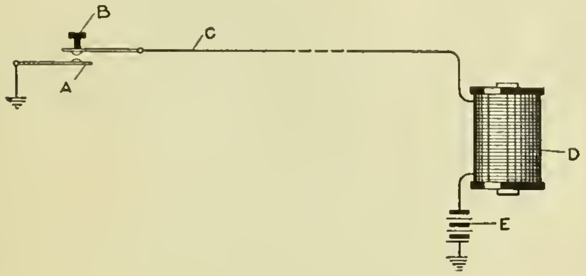


Fig. 1

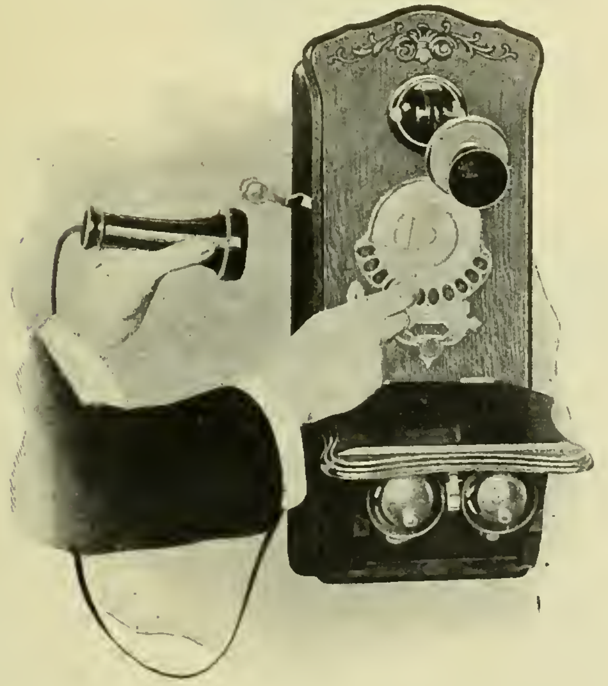


Fig. 2

If we wish to send electrical impulses to an electro-magnet over a considerable distance, and these impulses are variable in number as determined by the operator, the simplest form of completing the circuit would be by means of a push-button. For instance, in Fig. 1, if A is a contact connected with a lead to ground at a telephone subscriber's station, B a push-button adapted to connecting the line C to the ground spring A, and if D is a coil at a central exchange connected to one side of a battery E, the other side of which is grounded, then on pressing the push-button a circuit is completed through the coil D over the line C and ground which takes the place of a second line. If the coil D can be energized in this way, it can be made to do work. This is perhaps the fundamental principle of automatic telephony in its simplest form. In order not to waste time and in order to avoid mistakes in counting on the part of the subscriber, the dial represented on the automatic wall telephone, Fig. 2, was designed. The appearance of the telephone, it will be seen, differs but little from that of the manual, the only difference being the addition of this dial or calling device to the exterior of the box. This dial is connected by a shaft to an impulse wheel on the inside of the telephone. If the subscriber desires to send five impulses, for instance, he does not press a push-button five times, but instead inserts a finger in the dial opposite the figure five and pulls the dial around to a stop adjusted to retain the finger at a certain point. The impulse wheel, being secured to the dial, turns with it. The dial is then released and, actuated by a clock-spring, returns to its original position. In doing so the impulse wheel closes contact between one side of the line and ground five times. This design is merely to facilitate the sending of impulses to the automatic switchboard, and is more satisfactory than operating a push-button.

An automatic switchboard consists largely of machines operated by the subscriber by means of this dial to make and break connections between his own line and any other at will. In order to understand how these machines accomplish their work, let us begin with a system of ten subscribers only.

Fig. 3 illustrates ten subscribers' lines, terminating in ten pairs of metal plates or "bank contacts," arranged in the arc of a circle and numbered from 1 to 10. A ratchet-wheel R, is arranged with its centre at the centre subtended by this arc of contacts, and carries a pair of springs W technically called a wiper. The line of subscriber No. 1, by whom it is supposed that this machine is used, is represented as being connected not only to the first pair of bank contacts but also to the wiper W, to the rotary magnets, and to the release and rotary push-buttons.

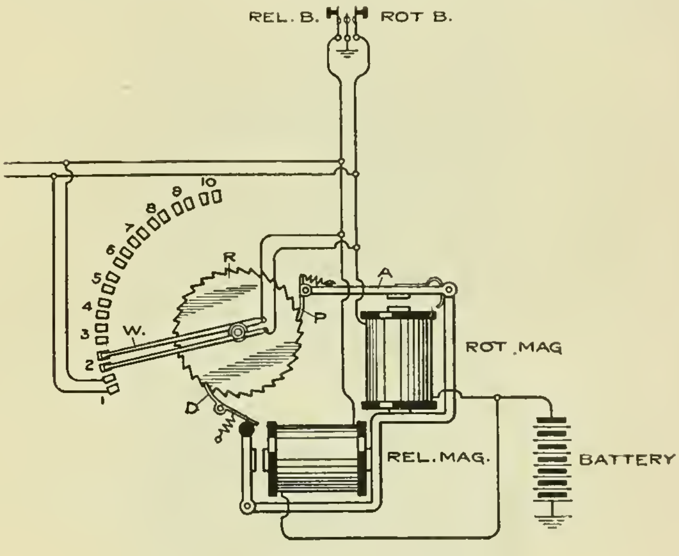


Fig. 3

Now suppose that subscriber No. 1 wishes to connect to line No. 2. He presses twice the rotary push-button located at his telephone. This closes a circuit twice from battery through the rotary magnet. Each time that this circuit is completed, the rotary magnet is energized and attracts its armature, A. This armature carries at the end of its arm the pawl P, which engages the ratchet-wheel R and moves it, and with it the wiper W, one step each time that the armature is attracted. Consequently, when A has been attracted and released two times, the wiper W will have been moved from its normal position at the left of the first pair of contacts and will rest upon pair No. 2 of bank contacts, thus bridging the gap between the terminals of line No. 1 and No. 2. By means not here shown subscriber No. 2 will be signalled and called to answer his telephone.

It is so arranged, that, when the conversation has been completed and the calling subscriber No. 1 hangs up his receiver, the release magnet will be momentarily energized and will attract its armature, thus pulling the retaining dog D out of engagement with the ratchet-wheel, which is then instantaneously returned to normal position by means of a clock-spring. This release is here represented as being effected by operating the push-button Rel. B. In a similar manner subscriber No. 1 could call any of the ten subscribers, or any of the other parties could by using his own machine call line No. 1.

Each of the subscribers of this system of ten would possess one of these switching mechanisms with its groups of ten bank contacts. In order that each subscriber should be able to connect his line with that of every other line from his own bank, the corresponding contacts of the ten banks must be connected together. Any one of the ten subscribers, then, who desired to call subscirber number 6, for instance, would select the sixth contact of his own individual bank. This is illustrated in Fig. 4. Here subscriber A is represented as having called subscriber B. The lines from A are attached to the fourth pair of bank contacts of each bank, while the lines from B are in like manner attached to the sixth pair of contacts. Subscriber A, with his line wiper on the sixth contact of his bank, in reality not only occupies the sixth contact of B's bank, but also the sixth contact of the remaining banks in this system of ten. Since the lines of subscriber B alone are attached to the sixth contact, any other subscriber selecting that contact will signal B only.

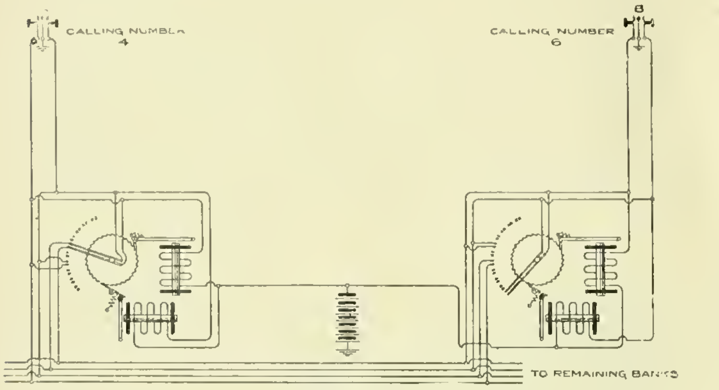


Fig. 4

Now consider a large group of subscribers, a group of one hundred. The line terminals or bank contacts will now fill ten of these bank rows. These rows are superimposed one upon the other, somewhat as shown in Fig. 5. The number of the line connected to the first pair of contacts in the first, or lower row, would be 11; the number of the line connected to the second contact in this row would be 12; the next 13, etc. The number of the line connected to the first pair of contacts in the second row would be 21; the line connected to the second pair of contacts in the second row would be 22, etc. It will be noted from this that in a system of one hundred lines every subscriber's number would contain two digits: the first digit would indicate in which horizontal row of bank contacts his line terminal could be found, and the second digit would indicate the exact pair of contacts in this row.

To get a rough idea of the method of obtaining a connection in a system of this size, we may again consider that each subscriber's line is connected to a pair of bank contacts and to a connecting machine, technically called a connector switch, somewhat after the fashion indicated in Fig. 5, which represents the connections for line No. 11. It will be noted that the important feature of this machine is the ratchet-wheel or hub R, which carries the wiper W previously represented in Fig. 3.

Fig. 5 also shows the rotary magnet with its armature A and pawl P; also the dog D for the retaining of the ratchet after each rotary step. The shaft on which the ratchet R is mounted is extended and carries another ratchet, VR, called the vertical ratchet. The vertical magnet is adapted to attract the vertical armature VA, which carries on its end the pawl VP, arranged to engage the vertical ratchet and to raise the shaft, and by means of it, the wiper one step whenever the magnet attracts its armature. The vertical dog VD is adapted to drop into place each time the ratchet is raised one step, and thus retain the wiper in position.

It will be noted, that, by means of the vertical pawl and ratchet, the wiper may be raised to a point opposite any one of the ten horizontal rows of bank contact pairs. Then, by using the rotary pawl and ratchet, the shaft may be rotated until the wiper rests on any desired pair of bank contacts in that horizontal row. Thus, if the vertical magnet should be intermittently energized three times and the rotary magnet five times, the wiper would be raised to the third row of bank contacts and rotated five steps, in this manner connecting line 11 to line 35. The apparatus is so arranged that subscriber No. 11 may intermittently energize the vertical and rotary magnets and control the movements of the wiper by turning the dial on his telephone, as has already been explained.

He is, therefore, equipped to operate his connector switch so as to place the wiper on the bank contacts of any one of the one hundred lines terminating in the group. In addition to the mechanism here shown, means are provided for him to signal any subscriber with whom he connects and talk with him. Means are also provided so that, when he completes his conversation and restores his receiver to the switch-hook, the dogs VD and D will be withdrawn, and the shaft carrying the wiper and ratchets will be returned to normal position by the action of a clock-spring and gravity.

In reality the circuits and mechanism of the connector switch are more complex than those shown here, but this figure illustrates the general principle, which is the main object of this paper.

Fig. 6 shows a photograph of a complete connector switch with its shaft wipers, wiper cords, coils, relays, and banks. The two lower banks are called the line banks. Each bank contains five rows of ten pairs of bank contacts. Two seperate line banks with two sets of line wipers are employed, in order to give more space between the vertical bank rows. The lower line bank rows thus represent the odd levels from one to nine, the upper the even rows from two to ten. The top bank is what is technically called the private bank. This bank, together with the upper wiper called the private wiper, is used to establish a guard over a complete connection. That is, if the line wiper of a connector switch should rest on the terminals of line No. 48, for example, then the private wiper of this switch would rest on contact No. 48 in the private bank, and in this way would complete circuits which would establish a guarding potential on this contact wherever it appears in the banks of any other switches; consequently any other subscriber attempting to call No. 48 while it is busy would automatically be given a busy

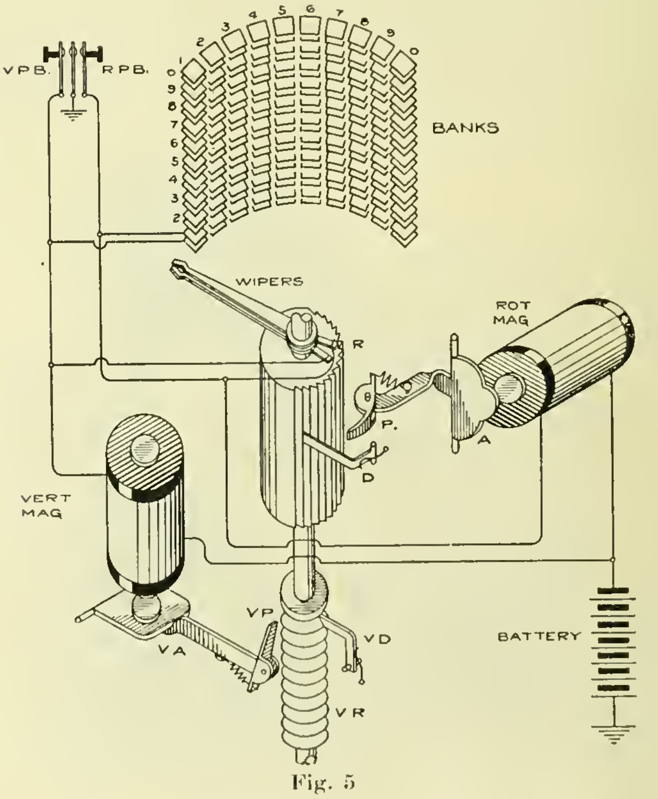


Fig. 5

signal. This "busy" signal consists of an intermittent buzzing sound transmitted to the subscriber's ear, and is the same as that often used in manual telephone systems.

Although for the purpose of explanation I have supposed that there would be one conneteor switch connected to every subscriber's line, this is not the case in actual practice. The switchboard would be entirely too expensive to compete with manual switchboards if it were necessary to provide on hundred of these connector switches for a group of one hundred subscribers A switchboard is, therefore, so arranged that only enough connector switches are supplied to provide for every subscriber who might desire to use one at the busiest moment of the day. It has been found from experience that ten of these switches will generally be enough for the maximum demand of one hundred subscribers, even in a very busy central office.

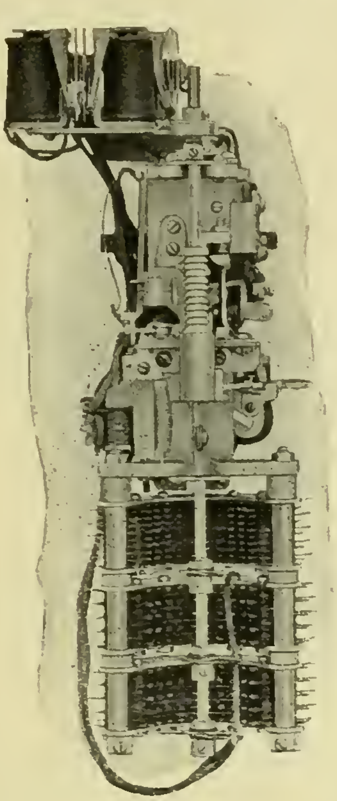


Fig. 6

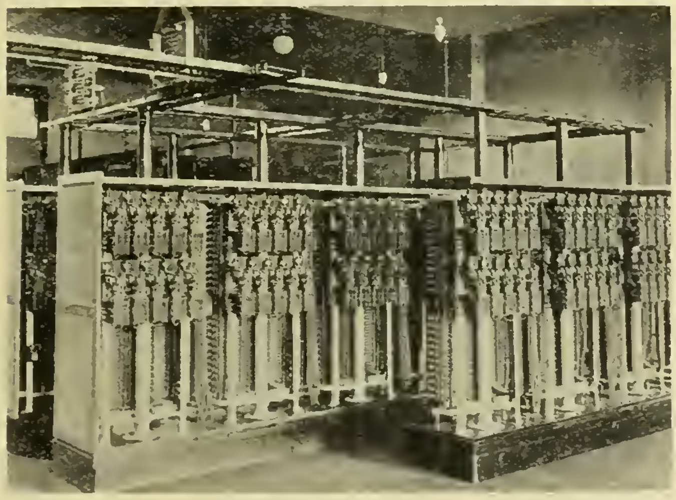


Fig. 7 Showing Banks of Connector Switches of which Fig. 6 is an Enlargement.

A system of more than one hundred subscribers—for example, a system of one thousand lines—is made by using ten of these one hundred line switch boards and installing apparatus for interconnecting between them. The machines which do this connecting are called selector switches. In general appearance they are very similar to the connector switches. The selector switches are interposed between the line switches and the connector switches, so that in a system of one thousand lines capacity a subscriber's line switch when it operates connects him through to an idle selector switch, instead of to an idle connector switch as previously described.

A ten thousand system would consist of ten groups of one thousand, each one thousand group consisting of ten groups of one hundred just described.

A New Engineering Supply Firm

The rapidity and thoroughness with which the average European adopts Canadian customs and business methods is often subject of remark, and Mr. Engh, manager of Canadian Agencies,, manufacturers' agents, Toronto, whose photograph appears herewith is just another striking example of this happy faculty of adaptability. Possibly his excellent technical training has much to do with this fact for Mr. Engh has graduated, at an early age, electrical engineer from the Technical University of Darmstadt, and spent several years both before and after his college course with large electrical concerns in Germany and Switzerland. His career on this continent has also been varied and full of experience. Coming to America eight years ago he spent five years with the New York Edison Company in their engineering department, leaving there to connect himself with another New York firm, Muralt & Company, engineers and contractors, as their chief engineer. Mr. Engh's Canadian work later began with the Niagara & Ontario Construction Company, of which he was for a time president and general superintendent. It was during his connection with this company and, to a large extent, through his efforts that this company secured important sub-contracts for the construction of the 110,000-volt transmission line now being built by the Hydro-Electric Commission to the various municipalities of Ontario.

Mr. J. Engh.

Mr. Engh is now turning his attention to the engineering supply business and through his company, Canadian Agencies, is carrying on a vigorous sales campaign in electrical machinery, porcelain insulators, tungsten lamps, arc lamps, indirect lighting fixtures, turbines, pumps, air compressors, concrete mixers, etc.

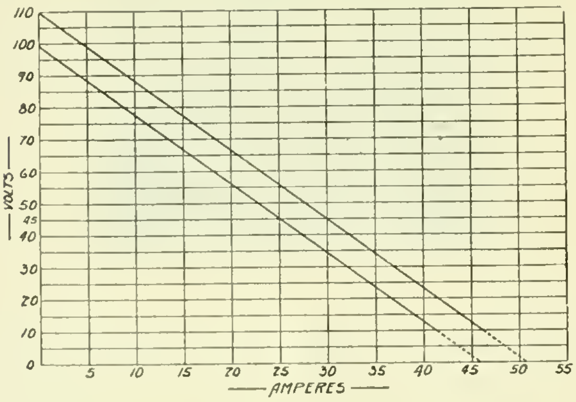
New Central Station Apparatus

Helios Motor-Generator Set

Theer are a number of commercial purposes for which the hand-fed open type of arc is essential, such as picture machines, search lights, etc. But the electric arc is inherently unstable, hence some device must be used in connection with the arc to act as "ballast." In direct current operation this is usually a resistance in series with the arc, as the open arc requires approximately 40-45 volts to operate satisfactorily and the commercial circuits on which it is connected are either 110, 220 or even higher voltage. Not only must, therefore, sufficient resistance be used to properly "ballast" the arc, but also an extra quantity to take up the difference between the line voltage and the 55 or 60 volts across both the arc and the minimum ballasting resistance.

Investigation of the electric arc shows that if two electrodes are placed a fixed distance apart and an arc is established, then, if the volume of current is increased, the voltage drop across the arc decreases. Practically all metals when carrying current show the reverse of this condition. It is thus apparent that a resistance made of metal when used in series with an electric arc will serve as a "ballast" and cause it to operate steadily. Besides this, when the carbons are brought into contact to start the arc, the degree of short circuit is limited by the resistance, and no disastrous result follows.

If the carbons of a lamp designed for 30 amperes, with the proper resistance for a 110-volt circuit, are in contact and the current thrown on, there will at once flow about 47 amperes. When the carbons have been separated to produce a normal, steady arc at about 45 volts, the current will be 30 amperes. As the carbons are farther separated, the current continues to decrease as represented by the upper curve in the illustration, which shows the entire range from one extreme to the other. In practice, of course, the arc would rupture before being drawn out to such a length as to require the full line voltage to bridge the gap between the carbons. Similarly a lamp and resistance designed for 25 amperes would show results as indicated by the lower curve in the illustration.



It is evident from the above considerations that it would often pay to install a motor generator set arranged to supply a constant potential of 60 volts from the generator and connected with the supply line on the motor end. This will save a considerable amount of energy even after allowing for the losses in the machines. Such a type of motor generator has recently been perfected by the Helios Manufacturing Company, which is believed to be a great improvement over any former device delivering a constant potential.

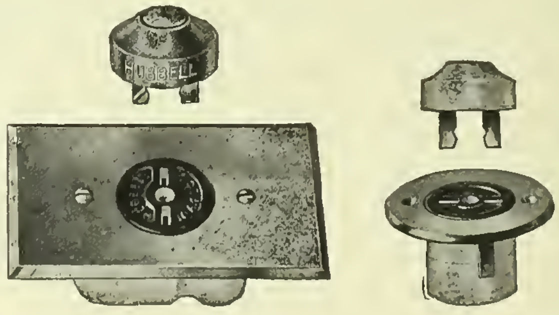
In the lighting outfit made by the Helios Company, the windings of the machine have been so arranged as to make the characteristic curve of this machine exactly correspond with the characteristic of the lamp as given in the illustration. Therefore, the lamp may be safely connected to the terminals of this machine, and operated in the usual manner without the intervention of any ballast whatever. It follows that whatever the circuit voltage may be, the only losses entailed in operating the lamp are those in the machines. But the efficiency of this machine is at least 75 per cent. and the actual saving effected by its use may be sufficient to pay for the investment in a few months.

Another important advantage of this machine is the case with which the voltage at the arc can be varied, thereby changing the volume of current which, in turn, varies the intensity of light desired, thus making it a very simple matter in the case of picture machines to increase or decrease the quantity of light desired on the screen depending on the density of the negative or the distance the screen is from the lamp.

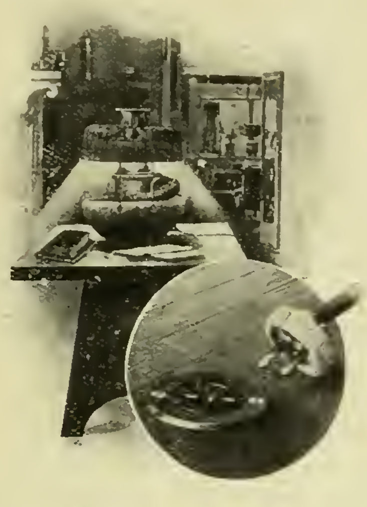
This motor generator set is thoroughly well-built. It operates at a slow speed and is therefore noiseless. It is especially designed to operate without any particular attention and has been demonstrated to be of great service to the consumer who has to oprate the open arc lamps. The advantage to the supply company using the three-wire system is also evident. The same idea embodied in this machine is at present being developed to operate moving picture machines from 25-cycle circuits, a form of light which otherwise could not be utilized.

Hubbell Receptacles for Electric Comforts

It is interesting to follow the development of comforts and conveniences that come with electric service. Not many years ago it was considered a luxury to have electric light alone, when an installation consisted of a very limited number of outlets, usually chandeliers, and without wall switches or pull sockets. Then came the portable lamp, suggesting wall outlets for convenient connecion beside the bed or reading table, and later with the introduction of heating apparatus and fans the necessity for ready outlets in all parts of the residence or office gradually made itself felt. How it has been met is best illustrated by a recent installation in the Trinity Building, New York City, where the offices have been equipped with 9,000 Hubbell flush receptacles. And to prove that this is not a case of clever salesman and susceptible purchasing agent, the same people cite similar orders for similar buildings: 6,000 in the Knickerbocker Hotel; 3,000 in the United States Express Building; 1,000 in the United States Customs House, all in New York. Aside from the Knickerbocker these are all offices where the receptacles will be used probably only for fans and portables. And for that matter, there will probably be no other use for them in the guest rooms of the Knickerbocker. The Hubbell combination of a

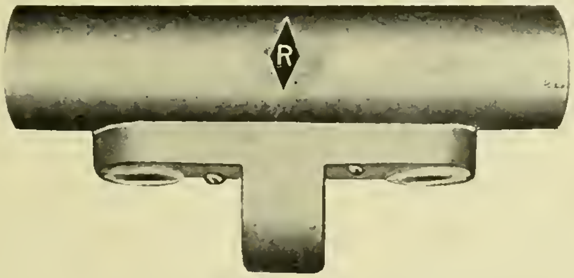


universal separable plug and a receptacle for every possible contingency is the key to satisfaction. There are some devices in the Hubbell line, all with the same objective—convenience. There is a new current tap with a side take-off, the regular standard cap being used. And there is a 10-ampere polarized flush receptacle for use on direct current apparatus where the polarity must be constant. This opens the door to the man who wants to enjoy the flexible use of d.c. radiators, motors, dental units, testing units and the like, for where there was danger of the plug being inserted the wrong way the risk was too great. In short, the Hubbell line points the way in plugs and receptacles that will bring good satisfaction to the user, and more business to the dealer.



Raymond Conduit Pipe Fittings

The Raymond Manufacturing Company, Limited, Guelph, Ont., an old established and substantial Canadian industry, is now manufacturing conduit pipe fittings on an extensive scale.



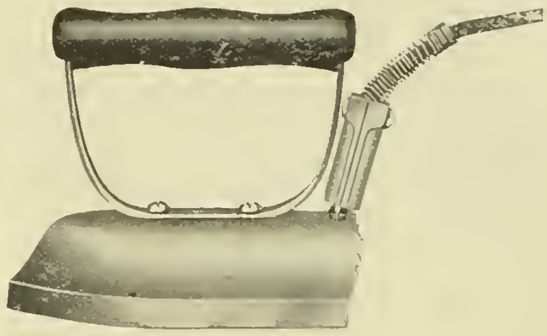
½ in. with Porcelain Cover for W'pf. Socket.

½ in. with 5-amp. Snap Switch.

On account of the large amount of iron condiut now used in the erection of office buildings, public buildings and industrial plants, there is an increasing demand for conduit pipe fittings. These fittings are furnished in either black or galvanized finish. The castings are well made and have clean cut heads. Two of the regular lines are illustrated herewith. The C. H. L. Keeler Company, Limited, 70 King street west, Toronto, have been appointed their exclusive sales agents.

National Electric Heating Company

The cut shown below illustrates the domestic sad iron being manufactured by the National Electric Heating Company, of Galt, Ontario. The iron is built of a solid casting with no parts to get loose and cause trouble. A little catalogue issued by this firm further illustrates their various electrical household appliances and in addition to giving prices, also states the current consumption—an important feature in electric heating in any form.



Recent Trade Publications

Meter Generators, Rotary Transformers and Converters—List No. 30, issued by Wright & Wood, Limited, Manufacturing Electrical Engineers, Halifax, England, giving prices for various sizes and types of the above mentioned apparatus.

Conduit Talk, No. 129, illustrating type "J" conduit with Hubbell Attachment Plug Receptacle. Conduit Talks are issued weekly by the Canadian General Electric Company.

"Union" Sectional Switch Boxes—issued by the Canadian General Electric Company. The apparatus is manufactured by the Chicago Fuse Wire & Manufacturing Company, New York and Chicago.

The Dongan Electric Manufacturing Company—Bulletin No. 11, illustrating their new line of D'Arsonval milli-voltmeters, mil-ammeters, ammeters and voltmeters, in a variety of types for testing, central station, isolated plant and storage battery installations. Bulletin No. 12, descriptive of their complete line of electro-magnetic portable and switchboard instruments.

Steel City Electric Company, of Pittsburg, has just issued Bulletins A and B, dealing with bushings, locknuts, fixture stems, fish wire, conduit benders, beam straps and watertight floor outlets. A price list is appended.

Dongan Electric Manufacturing Company—Bulletin No. 11, illustrating their new line of D'Arsonval milli-voltmeters, mil-ammeters, ammeters and voltmeters in a variety of types for testing, central station, isolated plant and storage battery installations. Bulletin No. 12, descriptive of their complete line of electro-magnetic portable and switchboard instruments.

The Empire Electric & Manufacturing Company, of Plainville, Conn., have recently placed on the market a new slate base gas engine switch, which is meeting with favor among the gas engine people. An illustration of this switch is shown in their advertisement in this issue.

The Electric Lighting of Automobiles—Bulletin No. 12, issued by the engineering department of the National Electric Lamp Association, covering with diagrams the various systems in use.

Canadian Westinghouse Company—Hamilton, circular No. 1017, dealing with the subject of potential regulators; and circular No. 1155, describing their series arc light system with Cooper-Hewitt rectifier—both well illustrated .

QUESTIONS AND ANSWERS

GENERAL RULES TO BE OBSERVED BY CORRESPONDENTS:

1. All enquiries will be answered in the order received, unless special circumstances warrant other action.
2. Questions to be answered in any specified issue, should be in our hands by the close of the month preceding publication.
3. Questions should be confined to subjects of general interest. Those pertaining to the relative value of different makes of apparatus, or which for intelligent treatment, should be placed in the hands of a consulting engineer, cannot be considered in this department.
4. To avoid trouble and unnecessary delay, correspondents should state their questions clearly, so that there can be no possible doubt as to the information required.
5. In all cases the names of our correspondents will be treated confidentially.

Induction in Auto Transformer.

Q.—How is it that the changes in the surrent flowing in the single coil as a whole, in an auto-transformer induce the secondary current in the secondary portion of the same winding?

A.—Any wire carrying an alternating current induces in any parallel neighboring circuit an opposite e.m.f. Thus in the case of an ordinary transformer the e.m.f. per secondary turn is equal and opposite to the e.m.f. per primary turn, the difference in the totals of the two e.m.f.'s depending on the number of turns.

If, now, the secondary turns are in continuous electric contact with the primary turns, instead of being insulated, the result is the same, and consequently the same wire can be used for both windings, forming an auto-transformer.

The primary voltage is distributed evenly over the turn. Thus in the case of a transformer of 550 turns for 110 volts, there would be 1/5 of a volt per turn, and if we wish to obtain 50 volts secondary, we can tap off anywhere in the winding, so long as we have 50 divided by 1/5, or 250 turns between the taps. As the induced current is in the opposite direction to the primary current, the winding between these two taps will only have to carry the difference between the primary and secondary currents.

This, of course, means a large saving in copper, and wherever it is not objectionable to have the primary and secondary in electric connection, the auto-transformer is more economical and efficient, than the double-wound type.

Changing Dynamo to Motor.

Q.—I have a shunt wound 110-volt 75-light dynamo with two field coils. I want to change it to a motor to run on 110 volt d.c. compound dynamo, 500 lights. What changes would I need to make on the shunt wound dynamo to change it into a motor and what horse power would it give?

A.—To operate your shunt wound dynamo as a motor, on the circuit specified, you will merely have to substitute a starting box for your field rheostat. As a motor the machine will have a slower speed since the field will be slightly weaker than when operating as a generator. You should obtain approximately four and a half horse power from the motor.

Functions of Motor Converter.

Q.—Will you kindly outline the functions of a motor converter?

A.—A motor converter is a modification of the ordinary induction motor generator. It consists of a direct current generator coupled to an induction motor, the two machines being electrically, as well as mechanically, interconnected. The high tension current circulates in the stator windings of the induction motor without the intervention of a step-down transformer. Owing to the counter e.m.f. of the direct current machine, the synchronous speed of the rotor does not correspond to the revolving field of the induction motor, but it depends on the pole ratio of the machines. Assuming that the two machines have an equal number of poles, the synchronous speed would correspond to half of that of the revolving field. Currents are, therefore, generated in the rotor windings at one-half of the supply frequency and these currents pass into the direct current armature by suitable cross-connections and are there commutated theoretically. In the case assumed one-half of the power of the combination is transmitted through the shaft, and the remaining half portion through the electrical cross-connection. In the case of the rotary, the direct-current machine acts as a generator; in the latter case the motor acts as a transformer and the direct-current machine acts as a generator; in the latter case the motor acts as a transformer and the direct-current machine is a generator. To a certain extent, therefore, the motor converter combines the advantages possessed by both a motor generator and a rotary converter.

Oil Affects Insulating Properties.

Q.—Does oil appreciably effect the insulating properties of mica?

A.—Yes, this is one of the chief causes of commutator troubles. A sheet of mica that would resist an e.m.f. of 10,000 volts for an unlimited time in air has been known to break down instantly under oil at an e.m.f. of 5,000 volts.

Rotary Converter Gives Either A.C. or D.C.

Q.—Can a rotary converter be made to give alternating current at one time and direct current at another?

A.—Yes, rotary converters are operated inverted in a number of stations which supply both alternating and direct current apparatus. Motor generators are, however, used more often for this purpose.

Test For Carbon Brushes.

Q.—Can you outline a method for testing carbon brushes? We have been greatly bothered with commutator troubles which we believe are due to the brushes.

A.—To determine whether the brush is homogenous and free from laminations and bird specks which scratch the commutator, break the brush, and the fracture will usually show the grain and reveal any imperfections that exist.

Standard Rule for Mounting Wattmeters.

Q.—Is there any standard rule regarding the mounting of wattmeters in the central station? I have noticed their use indiscriminately on both the back and front of the board.

A.—Sometimes wattmeters are placed on the front of the switchboard for show purposes, but this practice is waning. The switchboard attendant should have placed before him only such instruments and apparatus as he actually needs. Under ordinary conditions there are no reasons for placing the wattmeter on the front of the board.

Impurities in Storage Battery Acid.

Q.—What are the common impurities that may be expected in storage battery acid?

A.—Ordinary commercial acid is liable to contain traces of metals and also traces of other acids. Other impurities present may be due to the use of ordinary water from the water mains rather than from the use of distilled water. Any book on analytical chemistry will give a number of suitable tests for the detection of the various impurities.

Changing Direction of Rotation of Rotary Converter.

Q.—How may the direction of rotation of a rotary converter be changed?

A.—If the current supplied is two-phase, reverse the two leads of either one of the two-phases, and if three-phase current, reverse any two leads. Should the machine refuse to maintain its voltage it will be necessary to reverse the terminals of the field circuit so that the field current may be in a direction to assist the field magnetism.

Current News and Notes

Arnprior, Ont.

The Galetta Electric Power & Milling Company has decided to make a reduction in the price of lights. The schedule is similar to the one now in vogue in Pembroke and both flat and meter rates will be reduced. This will reduce the company's revenue by $2,000.

Belleville, Ont.

The contract for the electric plant for the city pump house has been awarded to the Canadian General Electric Company at $2,660.

Berlin, Ont.

The transmission lines for carrying Niagara power have reached this point and everything seems to be in readiness for the turning on of the current. This event only awaits the final touches to the main line connecting Niagara and Guelph, where unexpected delays have been encountered.

Brandon, Man.

The Brandon Electric Light Company has commenced the installation of a heating system for the business section of this city. The leading pipes will be 36 inches in diameter and will connect at required points with the small distributing system already in use in business blocks. It is hoped the plant will be ready for operation by October 1. Mr. G. A. Paterson, manager of the Electric Light Company, has the work in charge.

A proposition of the Brandon Electric Company to operate the city's pumping station electrically was not accepted. Negotiations are still pending with Mr. Chamberlain of the Great Falls Power Company and the Reese Engineering Company.

Brussels, Ont.

Forbes Bros., the rural telephone contractors in the vicinity of Brussels, have purchased an electric wagon to be used in conveying men and material from point to point. It will carry sixteen passengers.

Brockville, Ont.

The Brockville Light & Power Department has rejected the bids for the construction of the new power house adjoining the pumping station for the purpose of combining the two plants, owing to the bids being too high, and will do the work by day labor.

Blyth, Ont.

We are informed that the Blyth electric light plant was taken over by the Molsen Bank, of London, Ont., June 1st, and is for sale, together with a sawmill.

Bracebridge, Ont.

The towns of Bracebridge and Huntsville, Ont., have sent representatives to confer with Hon. Frank Cochrane, Minister of Lands, Forests and Mines, in reference to the High Falls water power. The town of Bracebridge has a lease to High Falls water power with development privileges, but, acording to the municipality of Huntsville, has neglected to utilize its privilege, and the town of Huntsville is anxious to obtain the right to develop the power. The government has promised to look into the matter.

Calgary, Alta.

Municipal street railway operation in Calgary, as evidenced by the statement for the first six months, is to be a success. A net profit of over 10 per cent. for the half year is shown.

The city council have adopted the recommendations of the street railway commissioners for extensions of the car lines to the suburbs, and a by-law to raise $454,000, to carry out the scheme will be given its two preliminary readings at the next council meeting, and submitted to the ratepayers at the earliest possible date. Besides many miles of new rails, the estimates include several bridges, twelve new cars and equipment.

Camrose, Alta.

The by-law authorizing the issue of $30,000 debentures for an electric light plant was carried. The installation will be begun at once and hurried to completion. Mr. Maxwell, B.Sc., has charge of the work.

Chicoutimi, Que.

The ratepayers voted down the negotiations for loan of $70,000 to be used in making payment to the Saguenay Hydraulic Company, upon part of its property desired for municipal lighting system.

Claremont, Ont.

The Claremont & Ashburn Telephone Company, Limited, has been formed. Capital, $10,000. Incorporators are Robert W. Ward and Dr. Ralph Brodie, of Pickering.

Cornwall, Ont.

The general contract for the erection of a residence for the manager of the Bank of Montreal, has been awarded to G. W. Lester. Messrs. Peden & McLaren, architects, Montreal.

Cobalt, Ont.

A. Ferland, Charles A. Richardson, W. C. Chambers, A. J. Burdett and W. A. Gordon have been granted permission by the Government to build a railway into Porcupine as a feeder to the Temiskaming & Northern Ontario Railroad. The proposed railway will be about 40 miles in length and will be operated by electricity. Power will be obtained from High Falls on the Mattagami river, for which surveys are now being made.

Charlottetown, P.E.I.

Sealed tenders will be received at the office of W. W. Clarke, city clerk, Charlottetown, until September 10th for supplying electricity for lighting the streets of Charlottetown and for commercial purposes. Bidders are to state price and illuminating capacity per lamp for street lamps and rate per k.w. hour for commercial lighting. For further information apply to the city clerk.

Digby, N.S.

Tenders are being called by Public Works Department, Ottawa, until August 10th for electric light fixtures, wiring, etc., for the public building here. R. C. Desrochers, assistant secretary.

Deschenes, Que.

The Hull Electric Company, of Deschenes, Que., have recently given some consideration to the various methods which could be adopted to prevent the theft of currency and tickets from fare boxes, and we understand that their general superintendent, Mr. G. Gordon Gale, has invented a device by means of which the door of the fare box is fastened in such a way that it is impossible to open the box without detection. A trial of this device is now being made by them and we may be able to give further particulars in an early issue.

Dartmouth, N.S.

The town of Dartmouth, N.S., is installing an electrical plant and will take over the street lighting, which they will in future operate from their own plant. The present electric light company then will continue to handle all the commercial lighting, they having a franchise which enables them so to do. The town plant is being installed by the Canadian Westinghouse Company and will be operated by water power.

Edmonton, Alta.

City Engineer Latournel submitted the detailed plans for the east end extension of the street railways. Tenders will be called for immediately and construction begun as soon as possible.

The contract of supplying steel fastenings for the street railway's new track was awarded to Gorman, Clancey & Grindley, the order given to Drummond & McCall being cancelled owing to that company's inability to supply the material until September. The former company guarantee delivery within three weeks from date of order.

The Government telegraph line has reached Grouard, 300 miles northwest of this point, the first messages being transmitted on August 3rd.

The Edmonton Heat & Power Company offers this city power at $20 per horsepower. The city must contract for 10,000 horse-power for 30 years to get this rate.

Before a decision is to be made by the council in regard to the offer of the Edmonto Heat & Power Company to supply energy to this city for $20 per horse-power per annum, the city commissioners are authorized to collect data in connection with the proposal to establish a municipal hydroelectric plant on the Athabasca river, at a point 100 miles north of Edmonton, and to prepare an estimate of the cost of establishing such a plant. They are also to consider the advisability of employing a competent engineer to make an investigation of the proposition.

Fort Frances, Ont.

The assessment of Mr. C. W. Bachus in Fort Frances on his hydro-electric development plant is placed at $400,000.

Fleming, Sask.

Tenders for telephone construction were received as follows: Wm. Bobier, Fleming, $385 (accepted); Berwick & Laster, Miniota, $418; Somerville & Taylor, Regina, $540.

Fort William, Ont.

The C. P. R. has requested the Kaministiquia Power Company to remove certain of its transmission poles which run along Syndicate avenue in this city. The ownership of this part of the avenue is in dispute, but the Utilities Committee of the City Council advised the Kaministiquia Company to make no change until such time as the C. P. R. had proved its claim to ownership.

In the matter of the level crossings of the street railway over the steam railway tracks at West Fort William, it has been decided that the city shall install interlocking devices pending the construction of a subway.

Fernie, B.C.

The big flume in connection with the Bull River Electric Power Company's installation is almost completed. The flume is 9,200 feet long, 16 feet wide and 7 feet 6 inches deep. Some 300 feet below the end of the flume the power house is situated on the banks of the Bull river. A theoretical head of 290 feet is obtainable, with which about 30,000 horse-power can be developed. Bull river empties into the Kootenay river in the neighborhood of Cranbrook, B.C.

Gorrie, Ont.

The Howick Telephone Company, capital $7,000, has been incorporated here by Messrs. Richard Carson, Charles L .Andrews and Robert H. Stephens, merchants.

Guelph, Ont.

The Bell Telephone Company will start work next week on their rural lines in Eramosa township. When the work is finished about 100 farmers' homes will be connected with the central office in Guelph.

The following contracts were let by the People's Railway recently: Concrete work between New Hamburg and Guelph, Chas. Robbins, Galt; grading, Berlin to Blooming, McMillan & Company, Berlin to New Hamburg, O'Brien Construction Company.

Galt, Ont.

The town council, in addition to awarding the contract for the step-down transformers for hydro-electric power to the Packard Electrical Company, have also placed an order with the same company for all of the service transformers to be used in distributing the power in Galt. The step-down transformers are composed of three 150 k.w. units. The service transformers total about 500 k.w., made up of 60 units, varying in size from 3 to 20 k.w.

Grand Falls, N.B.

It is stated that the company in which Sir William Van Horne is interested purpose constructing a hydro-electric plant and pulp and paper mills here. Among those interested are, B. B. Kinman and H. McLaughlin, of New York (both members of the Grand Falls Power Company); Jas. Robinson, ex-M.P., of Millerton, N.B.; A. J. Gregory, K.C., of Fredericton, and J. A. Brock, of Montreal.

Hamilton, Ont.

At a private conference between Mr. E. P. Coleman, manager of the Hamilton street railway, and City Engineer Macallum, difference in connection with the clause in the agreement dealing with street pavement repairs were amicably adjusted.

Mr. John Patterson, speaking of the Hamilton, Waterloo & Guelph Railway in connection with which he has spent some months abroad, states that the prospects for the construction of the road are good.

A new switchboard in connection with the fire alarm system is being installed. The system is now divided into 5 circuits, and it is hoped that such troubles as have previously been caused by high tension current and electric storms will not in future seriously effect the system.

The General Electric Company, of London, England, who purchased Dr. Hans Kuzel's patents for the manufacture of tungsten lamps for the British Isles, have large advertisements in several trade papers in England warning the consumer of the danger they run in buying pirated lamps. The General Electric Company have already issued writs against several electrical dealers to protect their rights. The Canadian Tungsten Lamp Company, who are manufacturing tungsten lamps in Hamilton under Dr. Hans Kuzel's patents, received word from their patent solicitor that he had at last received the legal transfer of the patents, all interference having been thrown aside.

Ingersoll, Ont.

The chairman of the Electric Light and Power Committee was authorized to prepare plans and specifications for new substation on Mill street, for which tenders will be called as soon as possible.

The following tender was recommended for acceptance: Canadian General Electric Company, for transformer for power station, $4,600; switchboards, providing a marble board instead of slate is supplied $3,500; street regulators, $1,500; street fixtures, $1,180.27; total, $10,780.27. Ross & Holgate, engineers.

Kamloops, B.C.

A new long distance telephone will shortly be installed between this city and Vernon.

Ladysmith, B.C.

The Hinton Electric Company, Limited of Victoria, has received the contract for the supply of all electrical materials in connection with the installation of the new Tungsten street lighting system here.

Lanark, Ont.

It is reported that T. B. Caldwell, of Lanark, has purchased the water power at Playfair, Ont., which he proposes to develop and transmit to Lanark to operate his factory. It is estimated that 500 h.p. can be developed.

London, Ont.

The city has awarded the contract to the Packard Electric Company for all the service transformers required for distribution of hydro-electric power in London.

Tenders have been let for the underground conduit work for the down town street lighting system and work has already begun.

At a special meeting of the City Council the City Solicitor was instructed to notify the London Electric Company to make their poles of a uniform height as required by by-law, and in case of refusal to do so within a reasonable time, to take such steps as may be considered necessary to enforce the by-law.

A report on electrolysis will likely be presented to the water commissioners shortly by Manager Dark. Some time ago the instruments for this work arrived here, and since that time tests have been made and data is being prepared for submission to the board. From what can be learned, great damage has been done, more so than was anticipated by the commissioners some time ago. Some years ago the commissioners had to relay a main on Thames street at a cost of several hundred dollars., destroyed by electrolysis, but the extent of the damage is believed to be more widespread than when the last examination was made.

Medicine Hat, Alta.

Bids will be received by D. Milne, mayor, for furnishing two direct connected gas engine driven 125 kw. alternating current units, each engine to be capable of delivering not less than 200 b.h.p. on natural gas of 1,100 b.t.u. per cubic foot. M. A. Maxwell, consulting engineer to city of Medicine Hat.

Moosomin, Man.

Tenders addressed to J. E. Easton will be received until August 23rd for building 34 miles of telephone line.

Montreal, Que.

Further contracts have been awarded by the Canadian Light & Power Company as follows: Messrs. Babcock & Wilcox, boiler equipment for terminal station at Cote St. Paul; Allis-Chalmers-Bullock, Limited, steam turbine equipment, consisting of 1,875 k.v.a.; John Inglis Company, contract for steel intake gates for entrance to Beauharnois Canal.

When Cote des Neiges was annexed to Montreal the street railway was requested to extend its lines into and serve this section at regular city rates. As the street railway's subsidiary line the Park & Island Railway, already serves this area, the request was refused. The question, after being decided, first in the city's favor, by the Railway Commission and later, in the company's favor by the Supreme Court, is now being carried by the city to the Privy Council.

The Saraguay Light, Heat & Power Company have erected poles from Cote des Neiges village—now a part of the city—to the corner of the Cote des Neiges road and Westmount avenue. The company is getting ready to light all the dwellings and to supply power to those who may require it.

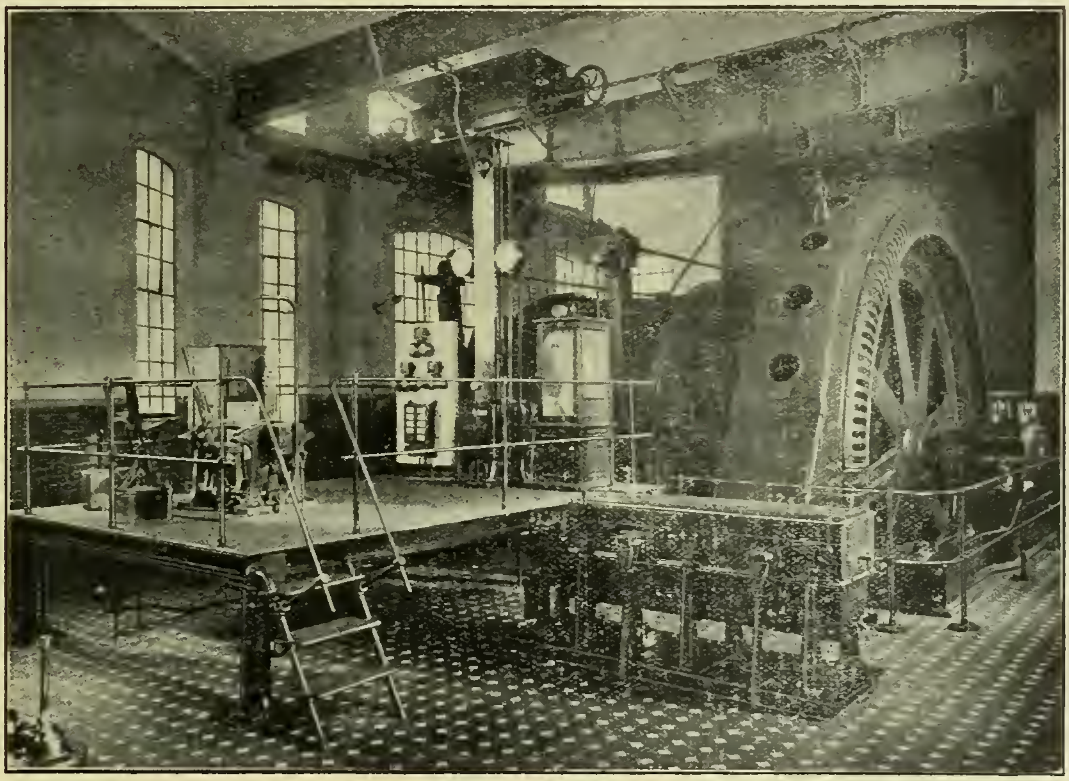
The questions at issue between the Montreal Light, Heat & Power Co. and the city of Montreal relating to disputed accounts for street lighting rendered the city by the company since December 31, 1908, have been submitted to the arbitration of a board composed of Prof. Herdt, McGill University, for the city; R. G. Black, Toronto Electric Light Company, for the company, and A. A. Dion, Ottawa Street Railway Company, chairman.

Trouble is threatened between the Canadian Light, Heat & Power Company and the Montreal Cotton Company over power privileges at the Beauharnois canal. The Canadian company is developing there and the Cotton company claims that its rights and leases are being prejudicially affected. Duncan McCormick, K.C., has lodged a protest at the Railways and Canals Department and threatened injunction proceedings on behalf of the Cotton company.

Long distance telephone communication between Montreal and such points as Ste. Agathe, St. Jerome, Valleyfield, Beauharnois, Joliette and Three Rivers has been still further improved by recent construction by the Bell Telephone Company. The additions to the company's system include new circuits from Montreal to Ste. Agathe, St. Jerome to Ste. Agathe, Valleyfield to Beauharnois and Joliette to Three Rivers.

Opposition to the proposed line of street cars along Dorchester street from University to Guy street is very pronounced. The residents and owners of property who want the street preserved for light traffic have presented a petition to the City Council in printed form with illustrations of buildings along the route. The illustrations are from photographs and shown as an argument that Dorchester street has a claim to being a residential district. On the front page appears a view of St. James' Cathedral, and then follow such buildings as the St. James Club, the Dominion Square Methodist Church, the Grey Nunnery, Olivet Baptist Church, the residence of Lord Strathcona, St. Paul's Presbyterian Church, the Western Hospital, the American Presbyterian Church, the

SIEMENS



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Moose Jaw, Sask.

The Moose Jaw Electric Railway Company, made up of Ottawa capitalists, has passed a preliminary order with the Lorraine Steel Company for 110 tons of steel rails. John B. McRae is consulting engineer. A. S. Dion, Ottawa, is president of the company. The line will be about six miles long.

The first six cars for the new electric railway will be of the pay-as-you-enter type.

The Canadian Boving Company has been awarded the contract, by the Moose Jaw Electric Railway Company, through their engineer, Mr. J. B. McRae, for two 200 b. h. p. Diesel crude oil engines. It is worthy of note that this is the first example of a Diesel engine installed in Canada. The engines will be manufactured by Mirrlees, Bickeston & Day, Limited, of Hazelgrove, Stockport, England. It is claimed by the manufacturers that all parts of a Diesel engine that do not come within a limit gauge of 1-30,000 of an inch are rejected, so that everything is absolutely interchangeable throughout and of the most careful manufacture.

North Vancouver, B.C.

Work on the Capilano car extension is being pushed rapidly by the contractors. The line is expected to be opened in October. The track is being cleared for the laying of the rails and a large gang of men are kept busily employed. The opening of the extended route to car traffic will divert it from the present Capilano terminus.

New Hamburg, Ont.

The following list of tenders for electrical apparatus for this municipality have been sent in: Puddicombe Estate, $7,560; C. H. Burgess & Company, $7,464; W. A. McKenzie & Company, $7,450; Brentt Noran & Company, $7,344. None of these were accepted. W. Millar, clerk.

The Packard Electrical Company have been awarded the contract for the step-down transformers for hydro-electric power for this town. The step-down transformers are composed of three 75 k.w. units. The service transformers total about 200 kilowatts make up of 13 units varying in size from 3 to 20 k.w. E. B. Merrill is consulting engineer.

New Westminster, B.C.

The British Columbia Telephone Company intends to add a substantial building to their present quarters, and within the next year replace the present individual hand ringing device with a central energy system.

The sailing vessel Mariecham, carrying 2,000,000 feet of lumber from the Fraser River Mills en route to Vancouver, was unable to pass under the high tension wires of the B. C. E. R. Company, where they cross the Fraser river, without lowering her top masts. The wires are 165 feet high and were placed at this point with the consent of the council of New Westminster.

Ottawa, Ont.

The difficulty concerning the water powers along the line of the Trent Valley Canal has been settled by the Department of Railways and Canals. Numerous concerns sought the powers but those to whom they have been assigned secure them on condition that certain lands required for canal purposes be acquired and also that the Department be relieved of liability for damages for flooding of lands. At dam No. 2, the power goes to the Trent Power Company or the Seymour Power Company, to be arranged between themselves. They are working in conjunction. The rate is to be determined. Five hundred horsepower is to be reserved for the town of Trenton. At dam 1 the power is to be allotted free to the Trenton Power Company, the Trenton Electric Light & Wator Company and the town of Trenton in accordance with judgments of the courts.

A building permit for a solid brick transforming station to cost $18,000, on south side of Slater street, has been taken out by the Ottawa Electric Company.

The report of the Board of Conciliation and Investigation, appointed under the Lemieux Act, on the question of increased pay for the C. P. R. telegraphers, provides for the abolition of the sliding scale and grants increases all along the line ranging from $5 to $15 a month. Some 600 telegraphers are affected.

Acting through the Hydro-Electric Power Commission, the city of Ottawa has made arrangements with the Ottawa & Hull Power Company for the supply of 1,500 h.p. more power. This brings the city's consumption up to 4,000 h.p. New conduits will be laid from the power house to the distributing station on Laurier avenue west.

Perdue, Sask.

The town council intends to install a telephone system which will connect with the wheat fields rural line now under construction. This is the first step towards the long distance line to Saskatoon.

Prince Rupert, B.C.

Voted on 8th August on proposition to municipalize telephone system. Carried by large majority.

Port Credit, Ont.

Contracts are reported to have been already signed for the use of 1,350 horsepower from the Port Credit sub-station and prospects are very encouraging for the building up of a large manufacturing centre at this point. The Port Credit station will be large enough to distribute power to Brampton, Milton, Georgetown, Acton, and possibly also to Mimico.

Point Grey, B.C.

The by-law granting the street railway franchise to the B.C.E.R. Company was carried by a small majority.

Ruskin, B.C.

The Western Canada Power Company will erect steel towers for their 60,000 volt line and wooden towers for the shorter 12,000 volt feeders.

Roseneath, Ont.

The Alnwick Rural Telephone Company, Limited, has been formed here. Capital, $3,700. Incorporators are Doctor Edgar W. Hadyn and Frederick A. Aylesworth, Alnwick, Ont.

Regina, Sask.

The following list of successful tenderers for telephone exchanges in the Province of Saskatchewan, has been forwarded to us: Scott—F. Somerville, Box 32, Regina, $1,810; Humboldt—Simpson & Craig, Virden, Man., $1,938; Vonda—Simpson & Craig, Virden, Man., $1,800; Davidson—Simpson & Craig, Virden, Man., $1,850; Outlook—Stanley L. Ross, Regina, Sask., $1,870; Broadview—Stanley L. Ross, Regina, Sask., $1,970; Whitewood—Stanley L. Ross, Regina, Sask., $2,123; Carlyle—Stanley L. Ross, Regina, Sask., $1,990. Letting of the contract for the construction of Watrous and Craik exchanges has for a time been deferred.

Stratford, Ont.

This municipality will purchase 800 75-watt tungsten street lamps from the John Forman Company, of Montreal. Lamps will be about 60 c.p

St. Mary's, Ont.

The towers for the cables of the hydro-electric line are now being erected within the town limits.

St. Hyacinthe, Que.

Contract for installation of gas pumping engines and street lighting system for town of St. Hyacinthe, has been awarded to the Colonial Engineering Company, Limited, of Montreal. Contract price, about $54,000.

St. John, N.B.

Investigations are being made on the St. John river and its tributaries with a view to the establishment of a series of storage basins for a steady power supply. Some fifteen engineers are at work at various points making daily readings.

The St. John Railway Company have opened offices for the display and demonstration of electrical appliances and propose to develop this end of their business vigorously. This is a comparatively new field of operations in St. John, and without doubt the St. John Railway venture will result in rapid development of this form of electrical supply.

St. Catharines, Ont.

The ratepayers on July 29th voted in favor of the by-law granting the Ontario Power Company, of Niagara Falls, Ont., a franchise to furnish electricity in St. Catharines.

An injunction restraining the Ontario Power Company from erecting poles and distributing power along the streets of St. Catharines has been allowed on the ground of certain irregularities in connection with the public vote which granted the privilege.

Seaforth, Ont.

Two by-laws for hydro-electric power were approved by the ratepayers on August 8th.

Stratford, Ont.

By a vote of 1,492 to 48 the citizens of Stratford carried the by-law accepting the proposition of the Stratford Railway Company to connect the city with surrounding towns. The by-law to purchase the local electric plant, at $43,800, also carried by a good majority. This plant will be utilized in the distribution of Niagara power.

Sherbrooke, Que.

The Sherbrooke Street Railway Company has awarded the contract for the construction of its power house in Sherbrooke to the Bishop Construction Company, of Montreal, Que. The Jenckes Machine Company, Limited, of Sherbrooke, has the contract for furnishing hydraulic machinery, and the Canadian General Electric Company for electrical equipment. About 1,250 horsepower will be developed. Ross & Holgate, of Montreal, Que., are consulting engineers.

Tillsonburg, Ont.

A by-law to raise $25,000 for the purchase, construction and installation of the necessary receiving and distributing buildings and plant in connetcion with power purchased from the Hydro-Electric Commission, was carried by a large majority on August 23rd.

Toronto, Ont.

The Toronto Electric Light Company claim the right to carry on business in the newly annexed parts of the city and ask the city council to agree to this interpretation of their charter. Failing this the matter will probably be tested in the courts.

Canadian Agencies, manufacturers' agents, have been awarded the contract for the supply of small insulators required in the city of Toronto's distribution system. The requirements will probably total about 30,000 units. These insulators will carry a 2,300 volt line but will have a nominal capacity of 5,000 volts.

The Board of Control has awarded the following contracts for the electrical substations to be erected at the corner of Ruskin and Edwin avenues: Masonry, Teagle & Son, $26,905; masonry, if artificial stone is used, $25,105; roofing, Duthie & Company, $187; plumbing, Fred. Armstrong & Company, $410; painting, James Casey, $170.

Victoria, B.C.

The desirability of making the present inspector of electric wiring a permanent official of the city and giving him power not only to inspect the wiring in new buildings in course of construction but also giving him power to inspect the wiring of all buildings has been referred to the Electric Light Committee.

The Telephone Company has made the proposition to the City Council that the city loan the company $100,000 to hasten the work of placing their wires underground, this sum to be repaid, principal and interest, in a stated number of equal annual instalments. The question will be submitted to the ratepayers and will probably carry by a large majority. In the event of the offer not being acceptable the company points out that much necessary extension work must be carried on at once by the placing of new poles which will make the matter of ultimately placing the wires undergorund far more difficult than at present.

Mr. A. T. Goward, local manager of the British Columbia Railway Company, recently met a representative gathering of property owners in the district of Saanichton and explained the terms on which the B. C. E. Railway Company would be willing to extend their system into the Saanich peninsula. The company asks a free right of way and a bonus of 5 per cent. of the value of the land bordering on the line of railway. The extension would cost about half a million dollars. It is guaranteed that the fares would not be greater than 3 cents a mile, with cheaper rates for return trips.

Vancouver, B.C.

The finance committee at its next meeting will take into consideration the establishment of an automatic telephone system for this city.

The British Columbia Copper Company is increasing its smelter capacity. The improvements will be completed in a few weeks and will give the Greenwood smelter a capacity of 2,700 tons of ore a day.

The Electrical Construction Company has received the contract for the installing of ornamental street lighting, at $15,940. The contract for lamp standards was let to the Ross and Howard Iron Works, at $45 each. Other bidders for material, etc., were: The Hinton Electrical Company, at $17,625; Cope & Son, $21,875; for lamp standards, The Vancouver Engineering Works, Limited, at $49 each.

Re-organization of the United Wireless Company is said to be under way, but it seems certain that a considerable number of unprofitable stations will be abandoned.

An improved telephone service has just been inaugurated by the British Columbia Telephone Company between Vancouver and Victoria cities. Hitherto there has been only one toll on messages between the two cities, namely, 50 cents per one minute and 10 cents for each additional fifteen seconds. In the change to be introduced a special night rate of 50 cents for three minutes and 10 cents for each additional minute will be established.

Regarding a request for an extension of the B. C. E. Railway lines in the Cedar Cottage district, General Manager R. H. Sperling has written the following: "Regarding the construction of a line from Cedar Cottage road, Agness road and Victoria road, on connect up with our line on the Westminster road, I beg to say that we have had an estimate made of the cost of this work and find that it would be over $20,000. While a connection such as this would carry with it some important advantages from an operating standpoint, the cost prohibits our undertaking it this year. As you are no doubt aware, the money market at the present time is in a somewhat unsettled condition and it is not so easy to obtain fresh capital as it was a short time back, and we have been instructed by our London board to incur only absolutely necessary expenditures until the financial situation becomes easier."

Mr. G. J. Ashworth, acting for the Electric Railway Construction Company, an entirely new organization formed for the purpose, has placed before the City Council a detailed plan for the construction of a scenic railway, electrically operated, and partly elevated on concrete piers, around Stanley Park. The estimated cost of construction is about half a million, in which is included an elaborate lighting system of the shore line. The matter was discussed by the council and laid over for further consideration at a future early date.

The B. C. Telephone Company has written to the Board of Works to the effect that as soon as a shipment of cable arrives from Montreal it will remove its poles from Pender street, between Jervis street and Burrard street. At the same time the poles will be taken down from inside the curb. An effort will be made to get the B. C. Electric Company to put up iron poles on Cambie street and to get the telephone company to remove its wooden ones there.

Prepapartory to reviving the Niagara Power scheme at the expiration of the two months' stay of proceedings promised by the aldermen when the public vote was taken June 20, the city council has decided to communicate with the Ontario Hydro-Electric Commission and ask on what terms the latter can supply the city with 15,000 horsepower from the falls. The 15,000 horsepower is the amount contemplated in the scheme of purchasing more current than the city needs for its own use and disposing of the surplus by export to Detroit.

Weston, Ont.

P. W. Sothman, chief engineer of the Hydro-Electric Power Commission, has advised the Council to build a small transformer station adjacent to the Town Hall, large enough to contain transformers and lightning arresters. The clerk was instructed to ask the Hydro-Electric Commission for plans of a building for hose reel, tower and transforming station.

Winnipeg, Man.

A rough estimate places the cost of deepening the Saskatchewan river in connection with the proposed waterway from Edmonton to Winnipeg at $15,000,000.

We are informed that the contract for supply of two sets of line disconnecting switches for the transmission line system, has been awarded to the Western Iron Works, Limited, Winnipeg, for the sum of $2,258.

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To sell insulating varnishes, either alone or as a side line- Must have good connection with electrical trade. Write Box 128 ELECTRICAL NEWS, TORONTO. 10

Electrician Wanted

Foreman for permanent position, Orillia Municipal Electrical Dept. Must be experienced and reliable. Thoroughly understand all line work, transformers, motors, etc. Married man preferred. State salary. Address TOWN ENGINEER, Orillia, Ont. 9

Wanted

One first class draughtsman experienced in the design of Hydro-electric plants. Apply stating education experience and salary expected and sending sample drawing and lettering to the chief engineer of the LAKE SUPERIOR POWER COMPANY. Sault Ste. Marie, Ont.

Miscellaneous

For Sale

Electrical Contracting Business, Hammered Brass Goods, Etc., established 12 years, population 18,000, rapidly increasing, 70 miles from Toronto, one opposition, several contracts on hand, good stock, past years profits $3,000.00, books kept. This is a genuine bargain. $3,000.00 Cash, owner going abroad.

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FINE BANK, OFFICE, COURT HOUSE & DRUG STORE FITTINGS.
OFFICE. SCHOOL. CHURCH & LODGE FURNITURE
SEND FOR CATALOGUE

The Electrification of Railways

In an exhaustive paper under the above title recently presented before the American Society of Mechanical Engineers by its president, Mr. George Westinghouse, the following extracts referring to the future of such electrification, appear:

The complete electrification of a railway will necessitate a rearrangement of ideas and practises in regard to operations. Coaling and watering places will not be needed; passenger trains will be differently composed, some classes being of less weight; and they will operate more frequently, thus promoting travel; other trains will be heavier than at present, or will operate at higher speeds; and branch lines, by the use of electrically fitted cars, can be given a through service not now enjoyed.

The movement of freight will undergo great changes, due to the fact that electric locomotives can be constructed with great excess capacity, enabling them to move longer trains at schedule speed on rising gradients.

The large percentage of shunting operations due entirely to the use of steam locomotives will no longer be required.

The railway companies can combine upon some co-operative plan for the generation of electricity, thereby effecting large savings in capital expenditures; and can utilize their own rights of way for the transmission of the current, not only for the operation of trains, but for many other useful purposes.

Notwithstanding the fact that great strides have already been made in cheapening the cost of generating electricity by steam engines, I foresee, from the progress made in the development of gas and oil engine power, a still further reduction in cost which will accelerate the work of electrifying existing railways.

One important aspect of this great question will engage the thoughtful consideration of every government, namely, the military necessity for uniform railway equipment in time of war.

In conclusion, I earnestly recommend to the serious consideration of railway engineers, the pressing need of a selection of those standards of electrification which will render possible a complete interchange of traffic.

MOONLIGHT SCHEDULE FOR SEPTEMBER

(Courtesy of the National Carbon Company, Cleveland, Ohio.)

Date.	Light.	Date.	Extinguish.	No. of Hours
Sep. 1	7 00	Sep. 2	4 40	9 40
2	7 00	3	4 40	9 40
3	7 00	4	4 40	9 40
4	7 00	5	4 50	9 50
5	7 00	6	4 50	9 50
6	6 50	7	4 50	10 00
7	6 50	8	4 50	10 00
8	6 50	9	4 50	10 00
9	6 50	10	4 50	10 00
10	6 50	11	4 50	10 00
11	6 50	12	4 50	10 00
12	6 40	13	4 50	10 10
13	10 40	14	4 50	6 10
14	11 40	15	4 50	5 10
16	0 50	16	5 00	4 10
17	2 00	17	5 00	3 00
18	No Light	18	No Light	
19	" "	19	" "	
20	6 30	20	8 40	2 10
21	6 30	21	9 10	2 40
22	6 30	22	9 40	3 10
23	6 30	23	10 20	3 50
24	6 20	24	11 00	4 40
25	6 20	26	0 00	5 40
26	6 20	27	1 00	6 40
27	6 20	28	2 00	7 40
28	6 20	29	3 10	8 50
29	6 20	30	4 20	10 00
30	6 10	Oct. 1	5 10	11 00
		Total	....	203 40

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Electrical News

Generation, Transmission and Application of Electricity

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EDITOR'S ANNOUNCEMENT.

Correspondence is invited upon all topics coming legitimately within the scope of this journal. Subscribers can materially assist by sending in news items and information regarding electrical development in all parts of Canada.

Vol. 19 Toronto, October, 1910 No. 10

Oxy-Acetylene Torch for Rail Bonding

The Twin City Rapid Transit Company, of Minneapolis and St. Paul, now uses an acetylene blow torch for applying copper rail bonds. The bonding outfit consists of a commercial oxy-acetylene blow torch supplied with gas from tanks carried on a small portable truck, the outfit complete weighing about 600 pounds. The truck as arranged for work on the city streets has wheels without flanges and may easily be moved along the pavement by two men. While the bonding work is in process the truck stands on the pavement about 6 feet away from the track and thus does not interfere with street-car traffic. A bonding gang is made up of one man, who operates the torch, his helper and another man who cleans the rail head in advance of the bonders. These three men will apply bonds at an average rate of six per hour in continuous work day in and day out, although but four minutes are required to weld a bond after the rail has been made ready and the torch, with its gas supply car, has been wheeled into place. About 100 cubic feet of oxygen and 75 cubic feet of acetylene at atmospheric pressures are used in applying thirty bonds to medium-weight rails. With heavier rails more gas is required because the larger body of metal absorbs the heat more rapidly. In applying bonds the head of the rail is not heated to any degree of redness nor to a temperature sufficient to anneal the steel.

The principal advantages claimed for this method of bonding are: (1) permanent mechanical and electrical contact obtained by fusing steel and copper; (2) economy due to rapidity of work, small gang and low cost of tools and supplies; (3) non-interference with traffic: a car may be allowed to pass any time during the bonding process; (4) portability of apparatus used in bonding.

It Pays to Preserve Wooden Poles

At the last meeting of the National Electric Light Association a report was presented on the subject of preservation of wooden poles, and contained much valuable information and statistics. At present it is estimated that there are required for renewals between 500,000 and 600,000 poles per year, and that during the next ten years this number will be increased to 900,000 or 1,000,000. As a result of direct inquiry from a large number of transmission companies, the life of various timbers when used for transmission poles was calculated as follows: Cedar, 13½ years; chestnut, 12 years; cypress, 9 years; pine, 6½ years; and juniper, 8½ years. The committee of the Association recommends strongly that the different companies should keep accurate and complete records of poles and cross-arms and collect authentic statistics and literature pertaining to wood preservation. It also recommends the seasoning, and in most cases preservative treatment, of wood. It is claimed that a well-seasoned untreated pole will last at least 30 per cent. longer than an untreated green pole. Directions are given for seasoning, and illustrations show clearly how the poles should be piled. The theory and various methods of wood preservation are also described in considerable detail. No particular process is recommended for all conditions, although experience appeared to indicate that coal-tar creosote gave the best results as a preservative, and that the high-pressure process of applying creosote is most flexible.

Tenders for Montreal Street Lighting

The tenders in connection with the lighting contract for Montreal's streets reveals as clever a bit of financing as one often sees and yet is only what might have been expected from such able men as H. S. Holt, Rudolphe Forget, Hon. R. MacKay, Sir H. Montagu Allan, C. R. Hosmer and the like. The conditions existing in Montreal are briefly,—the lighting contracts in the older parts of the city have expired, but some of the more recently annexed sections still are under contract to accept light for some years from the Montreal Power Company at a very remunerative figure, from the company's standpoint. The city council, hoping to relieve these sections of their heavier burden, have said that no tender would be received from the Montreal Power Company, which did not include all the streets within the present city limits. This seemed, of course, to the city council to place this power company in a position in which it must either forego its present profitable contracts in an attempt to continue business with the older city or relinquish all effort to renew the expired contracts which again would mean a great loss in equipment.

But a small problem like that is as nothing to Rudolphe Forget. It would be the work of a single night for him to conceive, organize, capitalize and assume control of a new power company, entirely separate from the Montreal Power Company, but just "having friendly relations." This new company, however, appears to have had a quiet two years' existence and to have been laid aside, as it were, for an emergency. It was called the Provincial Light & Power Company. It is said the directors of both companies may be identical. It is said that 95 per cent. of the stock is held by the old company. And the Provincial Light & Power Company puts in a tender—a low one—for the older section of Montreal. Thus the Montreal Light, Heat & Power Company maintains its hold on the old contracts and makes sure, if the city is wise, of the new. The new price is a decidedly advantageous one for the city, but is made possible for this company, owing to the fact that their equipment is already installed and in good working order. For sheer brilliancy of conception, the action of the Montreal Light, Heat & Power Company fills one with awe, while at the same time it emphasizes the tremendous handicap under which municipalities work, where men of this type are not available.

What Voltage Causes Death?

At the recent meeting of the British Medical Association Dr. S. Jellinek, of Vienna, read a paper on "Disorders and Death Following Electric Shock." He stated that, while in some cases fatal accidents had been brought about by shocks at 100 volts, in other cases, in which the voltage had been 1,000, and even 10,000, recovery had ensued. In order to understand a matter so seemingly inconsistent, the doctor stated, it should be kept in mind that the danger of an electric current depended on circumstances which might be placed in the following two categories: 1. The external: (a) voltage, (b) amperage, (c) number of poles, (d) the time limit of contact, and (e) the kind of current (a.c. or d.c.). The continuous current appeared to be more dangerous than the alternating. 2. The individual: (a) the resistance of skin and body, (b) the path of the current through the body, or over the surface of the skin, and (c) the condition of mind and body. The speaker stated that electric lesions were painless. With regard to the mechanism of death by electricity there was no definite scheme or model. In most cases it seemed like suspended animation. It was an interesting fact that there was between electric shock and death an interim of a few seconds in which the stricken person appeared to be quite in normal state. By experiments on dogs in the physiological institute of Prof. von Tschermak it had been discovered that the irritability of the brain, which had subsided immediately after a shock, had a few seconds later become reestablished, and everything then depended upon whether the action of the heart would be continued or not. As there were sometimes haemorrhages in the brain, and as the pressure of the cerebro-spinal liquid was increased, it was necessary and important in cases of first aid to lay the patient with the head elevated.

Quebec's New Observation Car

The accompanying figure represents a new observation coach which has been put on during the present summer by the new management of the Quebec Street Railway Company. As indicated in the illustration, the venture has proven exceedingly popular and the large number of visitors for which Quebec city is noted, during the summer season, have shown a keen appreciation of this attempt on the part of the company to cater to their requirements.

The coach makes a complete circuit of the Quebec city railway system, covering both the upper and lower city. The time required to make the round trip is an hour and a half, for which the charge is twenty-five cents.

Rapid Progress in Port Arthur

The accompanying figure represents the progress that is being made in the Port Arthur sub-station, now under construction by the Hydro-Electric Power Commission of Ontario. Power is to be obtained from the Kaministiquia Power Company's generating plant at Kakabeka Falls, and will be fed from their main lines, now leading to Fort William, at a point about nine miles out of Port Arhtur. At this point the generating company is erecting an outdoor switching station. The tank shown in the rear of the substation is a water reservoir which will supply both the city and the substation.

Line Withstands 200,000 Volts

Chief Engineer Sothman of the Hydro-Electric Power Commission, states that a test of 200,000 volts was recently made on their new transmission line from Niagara Falls to South Western Ontario. During the test five substations were connected up with the main line. The test at this voltage lasted for three minutes, during which time there was not the slightest indication of a breakdown.

The carrying requirements of this line, it will be remembered, are only 110,000 volts.

Electrical Activity in Maritime Provinces

Tanning Company to Install Electric Drive—Big Development at Grand Falls—Progressive Electric Supply House

The Logan Tanning Company, of Picton, N.S., are rebuilding their tannery which was destroyed by fire early in the season. They have decided to install an electric generator and motors to drive all their machinery. The Canadian General Electric Company has the contract for the immediate delivery of this apparatus, which will consist of a 125 k.w., 3-phase generator, three 40 h.p. motors, two 20 h.p. motors and two 15 h.p. motors.

The Nova Scotia Steel & Coal Company have placed an order with Daniel Adamson & Company, of Dukinfield, England, for two 500 k.w. exhaust steam turbines to be direct connected to two Siemens generators of 220 volts direct current. The order also includes all switchboard and electrical station appliances. It is expected that the plant will be installed and in operation by the first of next year. The company are also about to place an order for motors, which will aggregate about one thousand horse power.

Among the outside electrical men to visit this province recently, have been noted: T. R. Price, Sunbeam Lamp Company; H. D. Bayne, General Electric Company, of Sweden; I. T. Murphy, Canadian General Electric Company; D .W. Robb, Robb Engineering Company; John Christie, St. John Railway Company; James Waddell, chief engineer, Alexandria Hotel, Winnipeg.

The Eastern Telephone Company are engaged in making general extensions and improvements throughout Cape Breton. A new telephone line is being constructed, and an exchange is about to be opened in the new mining town of New Waterford, C.B.

The Valley Telephone Company have recently established an exchange in the town of Port Hood, including a submarine cable of about 6,000 feet, connecting with Port Hood Island; also a toll line connecting with the Nova Scotia system.

The Nova Scotia and Associated Telephone Companies held their fourth annual convention of superintendents and officials recently. The convention, which was largely attended, was highly successful in every way, valuable papers being read and discussed. Visitors were present from the New Brunswick, Prince Edward Island, New Cumberland, Antigonish and Sherbrooke Telephone Companies.

Maritime Telephone and Telegraph Company.

At the last session of the Nova Scotia legislature, S. M. Brookfield and Walter Covert, of Halifax, and A. E. Ings, of Charlottetown, obtained an act of incorporation for this company. They have now ordered a four-core cable and expect before the end of the year to lay a cable across the Strait of Northumberland and connect the lines of the Prince Edward Telephone Company with the lines of the Nova Scotia Telephone Company. They also propose to carry on a telegraph business on lines leased from the Nova Scotia Telephone Company. Within the last few days they have acquired a controlling interest in the Queens County Telephone Company and purpose making extensive improvements in the lines and plant of this company throughout Queens and Shelburne.

Electrical Development in Newfoundland.

Newfoundland is a country, the name of which when mentioned in the past, usually suggested to the average person, fish, fog and icebergs. This arose principally from the isolation of the island from the mainland and the conservatism of its inhabitants. This idea, however, is being gradually dispelled, and those who visit Newfoundland come back with nothing but unbounded praise for its magnificent scenery and wonderment at the unusual possibilities the future holds for the country.

Of the many natural resources Newfoundland possesses none are more notable than its great water falls, which are to be found on all the principal rivers and which are capable of producing in many cases a quantity of power greatly in excess of the requirements of the district for a long time to come. Several of these have already been harnessed and one of the most notable is the Grand Falls of the Exploits river, around which has grown up a town of the same name, and on the banks of which is located the famous pulp and paper enterprise of the Harmsworth people, considered the largest of its kind in the world.

To supply these mills and the town a most up-to-date electrical plant has been erected and few would imagine that right in the interior of Newfoundland stands a plant that will rival those of the large cities of America.

At this point the Exploits river flows over a series of declivities extending nearly one-half mile, with a fall of 150 feet at the bottom. At the highest point a solid concrete dam has been built 882 feet long, twenty-four feet wide at the bottom, gradually diminishing to six feet at the top and from twenty to twenty-five feet high. Wing dams increase the length to 1,400 feet. A forebay 150 feet square and twenty feet deep is provided with eight gates twelve feet high and eight feet wide. From this basin to the power house the present electrical equipment of 38,000 horse power volume of water flows through steel racks into two steel penstocks sixteen feet in diameter and 2,200 feet long. It may be stated here that the excavation for the forebays and penstocks amounted to 25,000 cubic yards of rock.

The power house is a building 270 feet long by 60 feet wide and 50 feet high, the site being cut out of the solid rock at the foot of the rapids. The equipment of the power house consists of a 2,500 h.p. Amme, Gusiecke and Kouegan scroll type, twin turbine. Direct connected to these are two Brown Boveri 1,875 kilowatt three-phase 50-cycle generators, 375 r.p.m. The switchboard was furnished complete by the Westinghouse Company. Regulation of the water wheels is obtained by an A. G. & K. new type hydraulic water wheel governor. Pressure for these is furnished from the pumping station, which station also furnishes pressure for 16,000 h.p. in pulp mill.

The town lighting equipment consists of a 375 k.w. Westinghouse type S single-phase transformer, raising the generator voltage of 550 to 2,200. There is also one 25 light Westinghouse arc light regulating transformer.

Although the town of Grand Falls has only been in existence a couple of years, it is, from an electrical standpoint, the most up-to-date town in Newfoundland. Three hundred and sixty-five houses, exclusive of public buildings, at present stand on the site, all of which are fitted with electric light and the great majority with heating and cooking electrical apparatus. There are in use now in the town over 3,750 sockets.

The Anglo-Newfoundland Development Company supply power to the residents of the town at the nominal price of six cents per 8 candle power light per month, and for cooking and heating at an equally nominal rate. It is, probably, safe to say that the amount of electrical appliances sold in Grand Falls with a population of only 4,000 would rival any Canadian town four times its size.

A Prosperous Electrical Supply House

Mr. C. C. Starr

One of the best known houses in the electrical supply business in the Maritime Provinces, and probably the oldest existing supply house in Canada, is that of John Starr, Son & Company, Limited, of Halifax, N.S., who are wholesale and retail dealers in electrical supplies and apparatus. The present business was started in 1882 by the late Mr. John Starr, who was the founder of the electrical business in the Maritime Provinces, and year by year has seen advance and progress, until to-day it has a reputation through the provinces of being a first-class supply house in every sense of the word.

The president of the company, Mr. C. C. Starr, who succeeded his father on the latter's death in February of last year, has been connected with the firm from its earliest days, and is one of the best known electrical men in Canada.

In addition to carrying a large and varied stock of high-grade electrical supplies and apparatus, they manufacture on the premises many lines of electrical goods, including the well-known Samson battery, which for years has been a standard open circuit battery in America. They also are electrical contractors and maintain a staff of wiremen and electricians to attend to this growing end of the business. The firm also represents a number of European and American manufacturers.

With the equipment they possess and the large stock always kept on hand the firm are in a position to supply the electrical trade at shortest notice and at lowest prices, and their large and growing trade speaks the appreciation of their efforts by the trade in general.

Mr. Willson, of McDonald & Willson, Toronto, with Mr. Dickson, of their Winnipeg office, spent several days recently in St. John.

The Makers of Electrical Canada—4

LOUIS A. HERDT—THE PRACTICAL-THEORIST

Among the makers of Electrical Canada there is no one who at such an early age, has done more to further progress in, and raise the standard of, electrical work in Canada than Louis A. Herdt, at the same time Macdonald Professor of Electrical Engineering in McGill University, Montreal, and Consulting Engineer for many of the largest electrical enterprises throughout the Dominion.

Although born in France, in 1873, Dr. Herdt came to Canada when a boy and was educated at the Montreal High School. He entered McGill University at Montreal in the Faculty of Applied Science, graduating in 1893 in the Department of Mechanical Engineering. After a short stay with the Laurie Engine Works, realizing the certain development in the electrical field, Dr. Herdt decided to go abroad and learn in the old world the new science of electricity. He took a short course in Paris at the Ecole Supérieure d'Electricité, but later studied at the Institute Electrotechnique Montéfiore at Liège, Belgium, where after covering the Electrical Engineering course, he was graduated with the degree of Electrical Engineer with first class honors. Following his graduation from Montéfiore he took up practical work in 1898, and entered the employ of the Thomas Houston Company at the Paris works, where he remained as their electrical designer for two years.

L. A. HERDT, MA.E., E.E., D.Sc.

In 1900 Dr. Herdt returned to Canada and joined the staff of the Electrical Department of McGill University as demonstrator. In 1907 he was made Associate Professor of the Department, and in 1909, on the resignation of Prof. R. B. Owens, was appointed to the Chair of Electrical Engineering. McGill University holds a prominent place amongst Canadian educational establishments. The Department of Electrical Engineering has graduated nearly 200 students since 1900. No institution in Canada or the United States can boast of an equipment superior to the one it possesses. In almost all electrical enterprises, both in Canada and the United States, McGill graduates (old students of Dr. Herdt) will be found holding prominent places. He is, therefore, truly one of the makers of Electrical Canada.

In addition to educational matters, Dr. Herdt, as already stated, finds time to interest himself in practical engineering work. He is consulting electrical engineer for the large hydro-electric development the city of Winnipeg is now building at Point du Bois, a development of 60,000 horse power with a transmission line of 77 miles. This work also embraces the sub-stations and distribution systems in the city in the form of underground conduit construction. Dr. Herdt's work in connection with the electrolysis of water mains in the city of Winnipeg—by the return electric currents of the Winnipeg Street Railway—a complete report of which was given in the Electrical News in September, 1909—has been reported upon by the technical press of the world. Following this report three sub-stations were erected, and the complete rebonding of the tracks of the street railway company was carried out. Indeed, Dr. Herdt's services as a consulting engineer are, and have been, much sought after. He has acted in an advisory capacity for the Montreal and Toronto Street Railways and for the Electrical Development Company, of Niagara Falls, and he is now acting as consulting engineer to a number of corporations and municipalities. He is also at present acting as arbitrator in the dispute between the City of Montreal and the Montreal Light, Heat & Power Company in connection with the city's street lighting, and is, at the moment of writing, retained by the city of Brandon to make a report on the various hydro-electric plans which have been submitted to that city.

Further, Dr. Herdt has made extended original research and investigation, and is the author of a large number of engineering and scientific papers, which have appeared in differferent technical publications, which have appeared in dif- the American Institute of Electrical Engineers, Canadian Society of Civil Engineers, Société Internationale des Electricians and the Canadian Electrical Association. His papers on the Predetermination of Alternator Characteristics, read at the Annual Convention of the A. I. E. E. in 1902; that of Armature Reaction on Polyphase Alternators, Electrical Review, New York, 1906; and Armature Reaction and Compounding of Alternators, Electrician, London, and Canadian Electrical News, 1910, are classical papers on the subject of alternating current machinery. His Chart for the Calculation of Transmission Lines, edited by the Hill-McGraw Company, of New York, is used extensively by engineers for this purpose.

In 1907, at the first meeting of the International Electro-Technical Commission in London, England, Dr. Herdt was the delegate to represent Canada and was a member of the Committee which drafted the rules and regulations governing the work of this Commission. He is president of the Canadian Committee of the Commission.

Dr. Herdt has given a great deal of his time and spared no efforts to promote the welfare of the Canadian Society of Civil Engineers, having been president of the electrical section for some years and a member of council. He is a member of the American Institute of Electrical Engineers, being local honorary secretary for Canada for that institution, a member of the Institute of Electrical Engineers, England, and Officier d'Académie, France.

English capitalists will build the proposed electric railway from London to Sarnia.

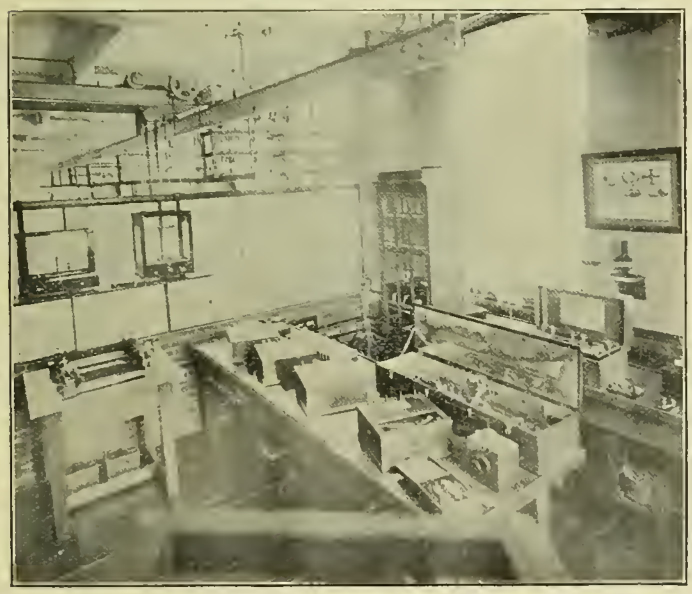
Standardizing Laboratories at McGill

The standardizing laboratories of McGill University form part of the equipment of the Electrical Engineering Department, and are maintained for the purpose of testing electrical machinery, apparatus and instruments for manufacturing and power companies, as well as for University educational purposes. The work is carried on by a competent and impartial staff of electrical experts under the supervision of Prof. L. A. Herdt.

Current Supply.—Direct current is obtained from a 300 k.w. hour storage battery and also from the University power plant. Alternating current is supplied from a motor generator set with the d.c. motor arranged for large speed variations and exact speed control can be obtained for different frequency currents.

D.C. Primary Standards.—For calibration of direct current instruments the laboratory is equipped with a Kelvin composite balance, used either as a Centi or Hecto ampere balance or as a standard wattmeter; a Weston laboratory standard ammeter with shunts from 1.5 to 750 amperes; a Weston laboratory standard d.c. voltmeter with multipliers 0 to 3,000 volts.

A.C. Primary Standards.—The Kelvin balance referred to is also used for a.c. ampere measurements; a standard Weston a.c. voltmeter with multipliers 0 to 750 volts and potential transformers that will read up to 2,600 volts. Four standard Weston dynamometer wattmeters 0 to 1, 0-5, 0-10, 0-50 amperes range and 0 to 2,600 volt range are available for wattmeter calibration. Auto transformers, potential transformers and current transformers are in use, so that instruments reading currents from 0 to 1,500 amperes and potentials of 0 to 2,600 volts can be calibrated with perfect accuracy.



Standardizing Laboratory, McGill University.

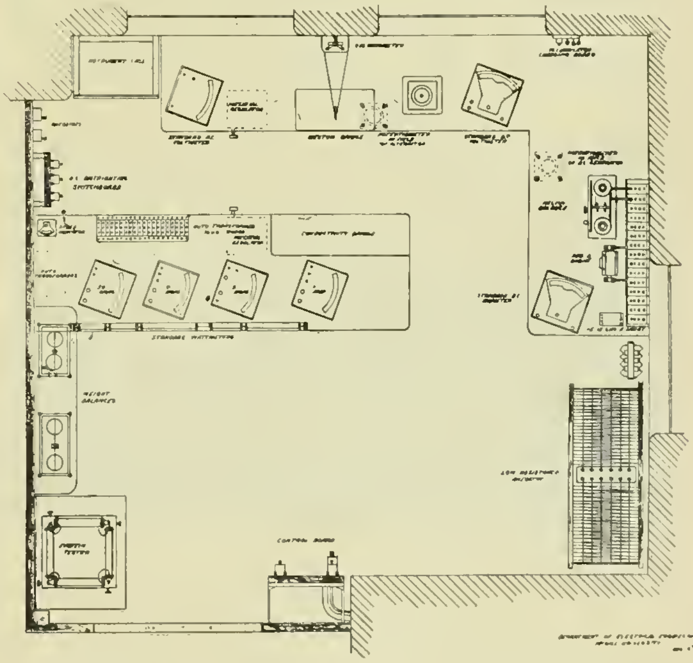
Resistance Measurements.—A Leeds and Northrup conductivity bridge is used for measurement of wires and resistance generally; this bridge is also arranged as a Kelvin double bridge for low resistance measurement. A Weston five-dial bridge with special Weston galvanometer is used for resistance tests. Standard resistances, standard Weston cells, standard capacities are used with a potentiometer to check the standards referred to above. Secondary standards are used for rapid commercial testing.

Iron Testing.—An Epstein tester is used for testing sheet iron samples; also a Ewing's magnetic tester is used, besides wattmeters and other apparatus too numerous to mention.

Photometer Laboratory.—This laboratory is completely equipped for the testing of all commercial sources of illumination. Among other pieces of apparatus are two photometers, one of the straight-bar type, graduated in inverse square to give direct reading and supplied with gas meters and gasometers for the measurement and supply of the standard gas burners. This photometer is very suitable for the camparison of gas and eleclic lights. The other photometer is of the Matthews' integrating type, suitable for the measurement of mean spherical candle power and the spherical reduction factor of incandescent lamps.

View of Section of Standardizing Laboratory,

High Tension Laboratory.—This laboratory is equipped with four 10 k.w., 200-50,000 volt, 60-cycle transformers and one formers and a 100,000-volt direct reading Kelvin electrostatic voltmeter is provided. A dynamostatic machine is in use for voltages up to 200,000 volts. Insulation tests on various insulating materials as well as tests on oil are carried out.



Arrangement of McGill Standardizing Laboratory

Oscillograph Laboratory.—This laboratory is equipped with 5 k.w., 100-25,000-volt, 60-cycle transformer with switchboard and suitable controlling devices. Current and voltage trans-a Blondel triple oscillograph, complete with photographic attachment.

Electric Power in and around Cobalt

The Mines Power Development (Con.)

Transmission at 44,000 Volts.—Aluminum Wire Used.—Power Used Chiefly by Mines.

[In our September issue a description was given of part of the electrical equipment in the Cobalt region, including the electric railway, the hydraulic plant and the generating plant of the Mines Power Company. The article is now continued with a description of the pole line and sub-stations of this latter company, following which the plant and equipment of the Cobalt Power Company is described at considerable length.]

The power generated at the Matabitchouan development of the Mines Power Company is transmitted over two 44,000-volt transmission lines to Brady Lake and Cobalt. A tap is also made about seven miles from the generating plant and feed wires led to a third sub-station at South Lorrain.

The Transmission System.

The transmission wires are supported on wooden poles, which have a normal length of 35 feet, and are spaced 132 feet apart, but these values are altered considerably at different points in order to suit the contour of the country. The conductors are of stranded hard-drawn aluminum, with the exception of the wires for long spans, which are of stranded aluminum, reinforced by a steel wire core. The aluminum used in the construction of the line was manufactured in Canada at Shawinigan Falls, Que., by the Northern Aluminum Company. The specifications for the cable called for a conductivity of at least 61 per cent., according to Matthiessen's standard, an ultimate strength of at least 25,000 pounds per square inch, an elastic limit of not less than 14,000 pounds per square inch, and a modulus of elasticity of at least 9,000,000.

The high tension line insulators are of the three-piece type, No. 362, manufactured by the Locke Insulator Manufacturing Company,of Victor, N.Y. The insulators were cemented and tested at the factory before shipment. Each part received a dry test of 95 per cent. of its arcing over voltage, which the specifications required should not be less than three times the shell's proportion of the working voltage, or 44,000 volts. The assembled insulator was tested at 95 per cent. of its arcing over voltage, which was specified to be not less than 120,000 volts. The potential in these tests was applied for three minutes. In addition to the dry tests, the insulators were specified to stand a potential of not less than 88,000 volts for three minutes when subjected to a vertical precipitation of not less than 0.2 inches per minute and not more than 0.3 inches per minute, and which had been applied for a period of at least ten minutes. Under a similar precipitation as that given above, only directed at the insulator at an angle of 45 degrees, the insulators were specified to stand a potential test of not less than 75,000 volts for three minutes.

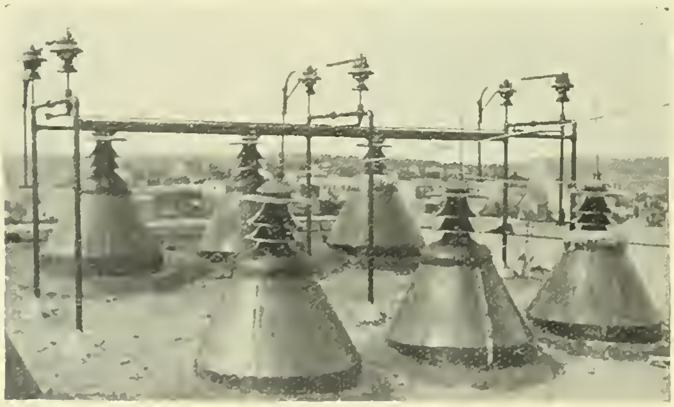


Fig. 1.—Roof Insulators, Cobalt Substation.—Mines Power Company.

The insulators are attached to the cross arms by a special malleable iron pin designed by the consulting engineers for the power company. This pin consists of three main parts,—a bolt threaded at both ends, a bell-shaped part which fits over the bolt and rests on the cross arm, and a thimble which was cemented into the insulator at the factory. Suitable washers and nuts are also supplied for attaching the bolt to the cross arm.

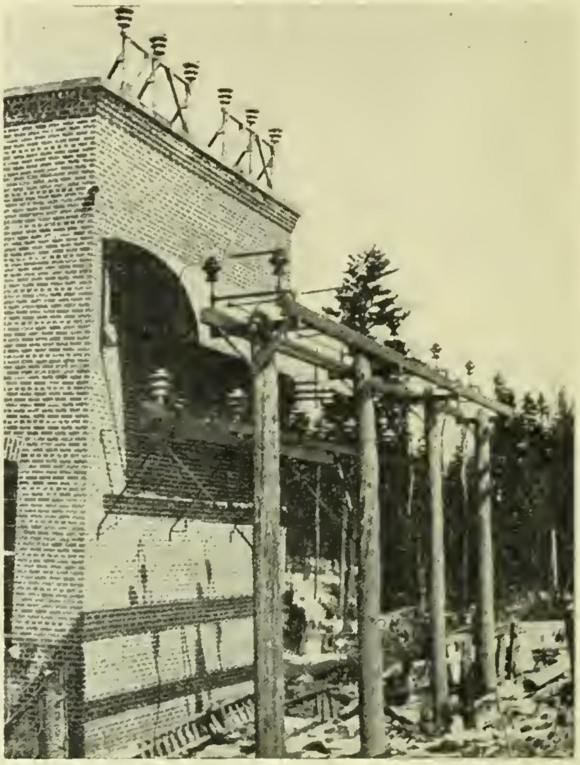


Fig. 2.—Brady Lake Substation.—Mines Power Company.

The cross arms are of long leaf yellow pine. The general cross arm construction is single armed with the exception of long spans, angles and railway crossings, where a double arm or special structure construction is employed. Head guys are provided on tangent lines every half mile, while at angles, long spans and railway crossings, special guying is provided.

In addition to the transmission wires, the poles carry a galvanized ground wire and telephone wire. The ground wire is attached to a malleable iron support, bolted to the top of the pole. The ground wire consists of 7-strand ¼-inch galvanized steel wire, specified to stand a pull of 4,000 pounds without breaking. It is grounded every second pole by a wire stapled to the side of the pole and given a few turns about the portion which rests in the ground.

The telephone circuit is transposed every third pole and in addition there are occasional transpositions of the 44,000-volt line. These combined transpositions, designed to thoroughly neutralize the inductive and electrostatic effects of the high tension current on the telephone line, have given very gratifying results inasmuch as communication between the various sub-stations and the power house is carried on, with practically the same clearness as if there were no high tension current in the vicinity.

The Cobalt Sub-station.

In general the power is used in connection with mining work. The Cobalt sub-station stands just across the lake from the railway depot. The building is divided into two sections, one part containing the transformers, switching equipment, lightning arresters and auxiliary apparatus of the sub-station, while the other part contains two large induction driving motors and air compressors. The transformers and switchboard are located on the main floor; the lightning arresters, high tension wiring and switching equipment in a separate room above. A basement contains the oil tank, oil pump and other auxiliary apparatus. To give the operator a clear view of the compressors, a section of the wall separating the two parts of the building was left open.

The high tension wires from the two transmission lines enter the high tension switching room through roof insulators (Fig. 1) of a similar type to those installed on the roof of the power house and referred to in last month's article. All high tension wiring in the switching room is supported either on wall insulators or on insulators attached to a pipe structure. Arrangements are provided whereby the two transmission lines can be thrown into parallel by means of a 44,000 volt oil tie switch. These two inter-connected sections form a high tension bus bar from which taps are made through 44,000 volt switches to the transformers, located on the floor below. The lightning arresters, which are of the electrolytic type, are located along one side of the high tension roof opposite to the bus bars and switching equipment. These, together with the ground wire over the transmission line, have given excellent protection during the past season, as the power company has experienced no trouble due to lightning.

The transformers are located in pockets on one side of the sub-station. There are five pockets, three of which contain transformers at the present time, the others being kept as spares. The transformers are of the 3-phase oil insulated water cooled core type, and have a normal rating of 1,250 k.v.a. The high tension windings are arranged for service on any of the following circuits: 44,000-42,000, 40,000-38,000 volts, while the low tension windings are interchangeable for 2,400 and 600 volts. The transformers are provided with wheels in the base which run on rails in the floor, while in front of the pockets is provided a transfer truck which allows of easy exchange in the location of any of the transformer units in case of trouble.

The low tension leads from the transformers run overhead to the low tension bus bars located in the rear of the switchboard. The low tension bus bars are sectionalized and all circuits are controlled by remote control hand operated oil switches located at the rear of the switchboard. A station voltmeter is located on a bracket at one end of the switchboard. Each line panel is equipped with an a.c. ammeter, ammeter plug receptables and overload relay, while each transformer and feeder panel has in addition to the above, voltmeter plug receptacles and an oil switch handle. The switchboard at present consists of 15 panels. The centre panel is an interconnecting and outgoing line panel, the two adjacent to it are incoming line panels, and the next two on each side transformer panels, while the four panels at each end of the switchboard control the air compressor motors and local feeder circuits. The incoming line panels are equipped with reverse current overload relays, while the interconnecting transformer and feeder panels are equipped with inverse time limit overload relays. At one end of the switchboard is located a small meter room, where meter tests, etc., are made. The main floor also supports the local distribution switchboard, which controls the lighting circuit.

The greater amount of power taken by the Cobalt sub-station is used by the two 1,000 h.p. induction motors which drive the air compressors in the air compressor room. The compressors are operated from the motors by rope drive and distribution of the compressed air is made over the Cobalt district in metal pipes of different sizes, varying from 15 inches in diameter down. A pressure of about 100 pounds is maintained.

Brady Lake Sub-station.

The Brady Lake station (Fig. 2), is located near Brady lake about six miles from Cobalt, and is of brick construction. Like the Cobalt station it consists of a combined step-down sub-station and air compressor room. The sub-station is smaller than the one at Cobalt and the arrangement of the electrical equipment is materially different. The high tension room and secondary wiring and switchboard are arranged on one floor, which overlooks the air compressor room through a bay in the side wall, similar to the Cobalt station. The basement below this room contains the lightning transformers for the building and auxiliary apparatus for the station. The high tension wires enter the room through roof insulators. The high tension wiring, electrolytic arresters and oil switches are located in the central section of the building at the rear of the switchboard, while the transformers are located in pockets at each end of the station. The present transformer equipment consists of three 375 k.v.a. 3-phase transformers, but these are to be removed shortly to the sub-station at South Lorrain and will be replaced by three 1,000 k.w. 3-phase units. The switching arrangements of the Brady Lake station are similar to those in the Cobalt station. The switchboard is of marble and the panels are equipped similarly to those at the other station.

The Mines Power Company have now under construction at South Lorrain a sub-station which will supply the mines of this district. This work is also in the hands of the engineering firm of Smith, Kerry & Chace, who have had charge of the Mines Power construction throughout.

The Cobalt Power Development

Situated at Hound Chutes.—Swedish Generators Installed, Vertical Type.—Nineteen Substations Served.

This plant is located at Hound Chutes, on the Montreal river (Fig. 3) about 7 miles south by east from Cobalt. It is difficult of access from every side, but the seven miles of most primeval corduroy, trying alike to man and beast, is amply compensated for in the very first sight of one of the tidiest little plants in Canada. The complete hydraulic layout, including the power house building was designed by Mr. A. Vonaesch, M.E., chief engineer of William Kennedy & Sons, Owen Sound, which latter firm supplied all the hydraulic apparatus. The electrical plans, including power house, transmission lines and sub-stations, were supplied by the contracting firm of Kilmer, Pullen & Burnham, Toronto.

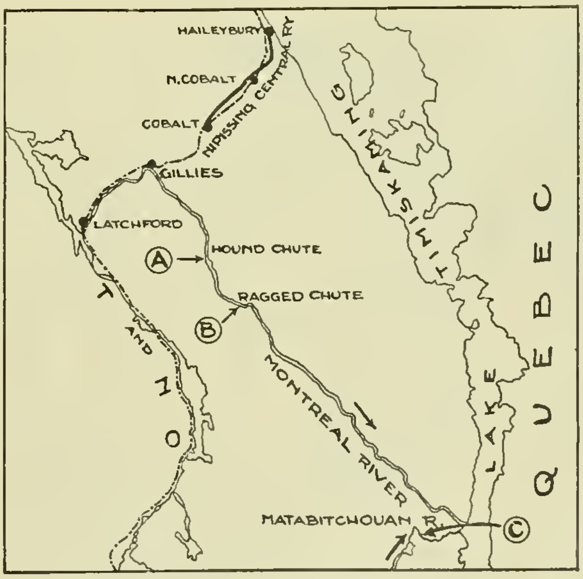


Fig. 3.—Showing Location of Electrical Activities in the Cobalt region.

The low water discharge of the Montreal river is calculated in the neighborhood of 800 c.f.s. and the high water discharge at 17,000 c.f.s. Owing to the natural width of the river just above the Chutes, it was deemed unnecessary to make any extra provision for storage. The natural fall at this point is about 17 feet, which, by a temporary timber dam, has been increased by

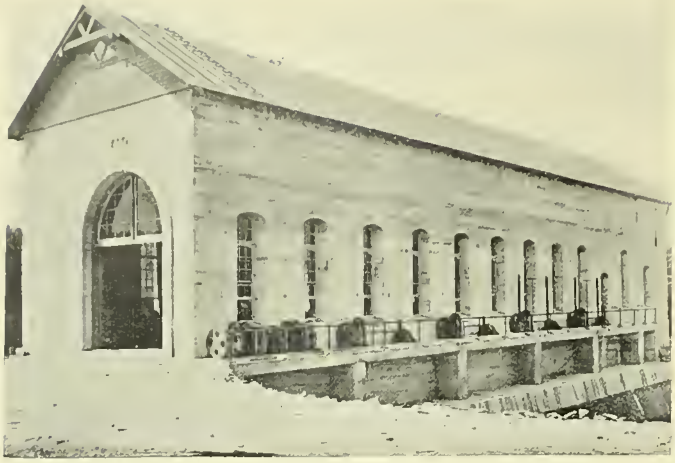


Fig. 4.—Power House, Cobalt Power Company, Intake Side.

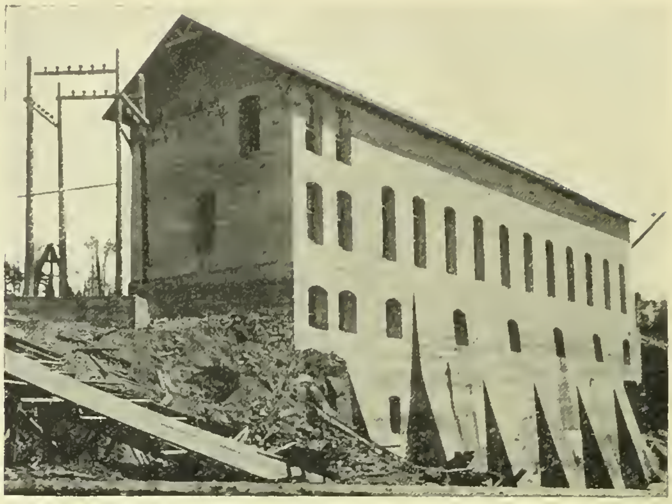


Fig. 5.—Power House, Cobalt Power Company, Discharge Side

almost an equal amount. The timber dam is strongly built, 34 feet wide, and 200 feet long, but in accordance with the plan of solidarity being followed throughout, it will be immediately replaced by a concrete dam. The location for this latter is unusually favorable as a few feet below the timber dam and just on the crest of the Chutes the sides and bottom are of solid rock. The contract for the construction of this dam has been awarded to Mr. E. Smith, recent superintendent of the Cobalt Power Company. While work is in progress on the dam the timber structure will act as a diverting dam and all water will pass down the head race.

The head race, about 1,000 feet in length, follows what is believed to be the old river bed, from which the water has at somo time become diverted to its present course. It has a capacity of 2,000 cubic feet a second, which, under a calculated head of 33.4 feet, will develop about 6,000 horse power. The head race dam consists of two stop log piers and abutments, built of concrete, reinforced with steel rods and anchored to the solid rock.

The generating station (Figs. 4 and 5) is also of concrete. Teh generators were manufactured by the General Electric Company of Sweden and purchased through their Canadian agents, Messrs. Kilmer, Pullen & Burnham, which firm is also responsible for their installation. The order for this apparatus was placed in March, 1909, and the plant was completed and in operation within a year. Since that date we understand operation has been uninterrupted.

The Generators.

The generator units, three in number (see Fig. 6), are of the vertical shaft type, 875 kilowatt capacity, 3-phase, 60-cycle,

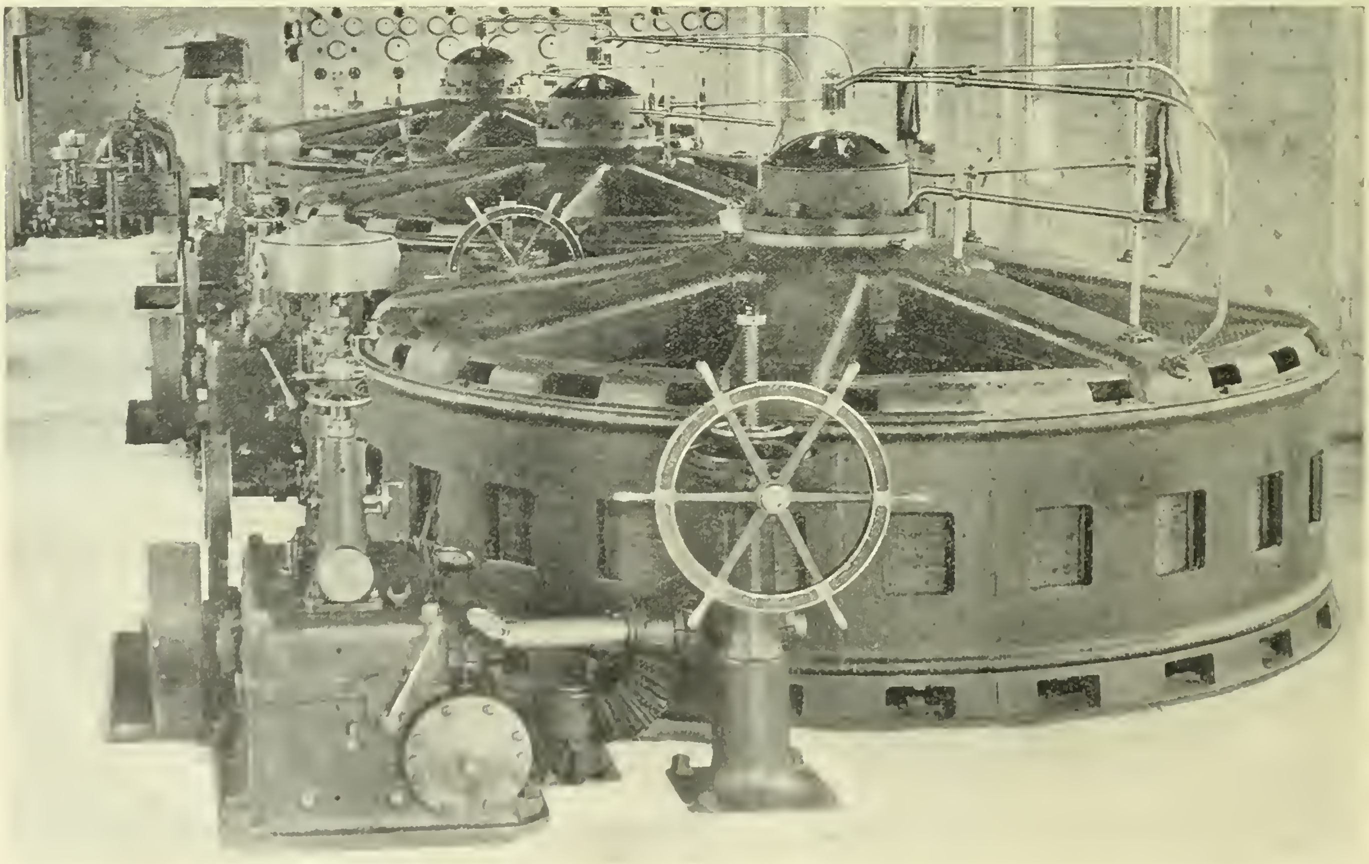


Fig. 6.—Swedish General Electric Generators installed by Cobalt Power Company at Hound Chutes.

11,000 volts, operating at a speed of 150 r.p.m. The diameter of a generator is 14 feet over all. A unique feature of these machines is the method in which the weight of the revolving field is supported by a specially designed ball thrust bearing mounted upon the top of the generator frame in a position which is easily accessible for inspection and repair. The machines are also supplied with two guide bearings, one on each side of the revolving field in order to take up any side thrust. Means are supplied for adjusting the bearings so as to maintain a uniform air gap. Lubrication is supplied on the gravity system from a reservoir on top of the generator, the oil passing through the bearings and being caught in a receptacle beneath the machines, after which it is filtered and passed again into the storage system. In view of the fact that the transmission line was of a moderate length, it was deemed advisable not to use transformers, but to wind the machines for the line voltage, and by this means make it easy to supply power over a fairly wide range of territory. Cut No. 7 shows a section through one of the main units from which may be clearly seen the arrangement of thrust and guide bearings on both generator and turbine. Cut No. 8 shows a section through the main units as well as exciter units, from which it will be seen that the arrangement for the small exciter units is on exactly the same principle as for the a.c. generators.

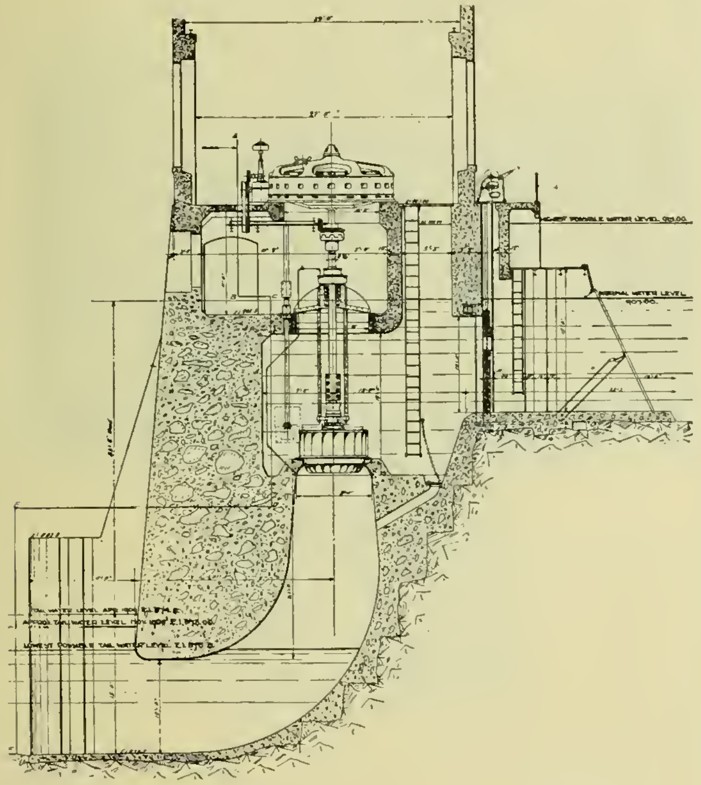


Fig. 7—Vertical Cross Section of Power House.

The Exciters.

The exciters, two in number (Fig. 9), are each of 60 kilowatt capacity, operating at a speed of 500 r.p.m. These machines are also manufactured by the General Electric Company of Sweden and are of the vertical shaft type, the revolving armature being supported in a similar manner to the large generators. In this case, however, guide bearings are also of the ball bearing type. Lubrication is supplied in the same manner as for the larger machines. Each exciter unit is of sufficient capacity to operate four a.c. generators as well as supplying current for lighting the power house. The a.c. generators are connected to the switchboard by means of three-core lead covered cable carried in a duct way below the main generator floor. All field leads and exciter cables, etc., are of lead covered cable.

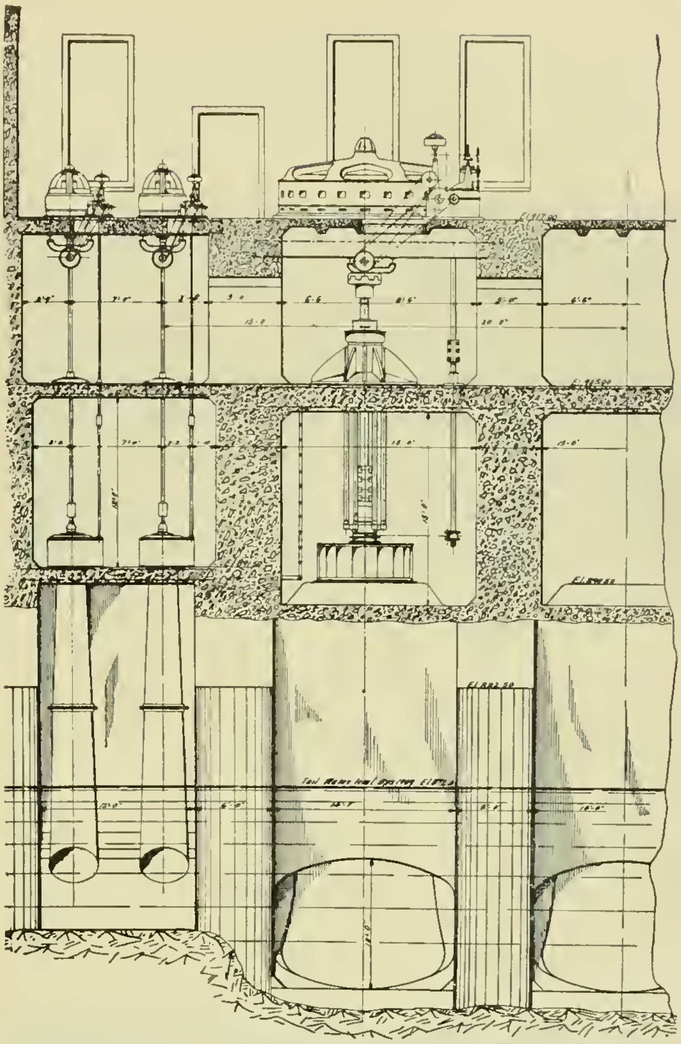


Fig. 8.—Vertical Longitudinal Section of Power House of Cobalt Power Company.

The Switchboard.

The switchboard (Fig. 10), which is located at one end of the building, is mounted in a space left in the wall dividing the main power house floor from the high tension chamber, and consists of eight panels of grey Italian marble, made up as follows: One exciter panel, four generator panels, one totalizing panel, two line panels. The synchronizer, bus-var voltmeter and machine voltmeter are mounted on a swinging panel fastened at one end of the switchboard. Behind the board (Fig 11) are mounted on the angle iron framework all machine rheostats, relays and fuses.

The generator switches, line switches, series and potential transformers and disconnecting switches are mounted in the high tension chamber in reinforced concrete cells. These cells are placed about 10 feet back of the switchboard, the switches being

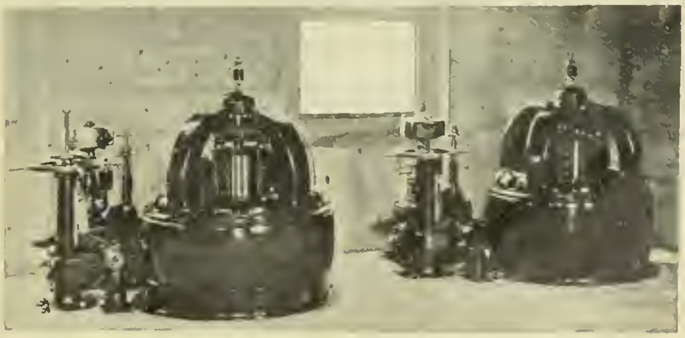


Fig. 9.—Two 60 k.w. Exciters—Cobalt Power Company.

of the remote manual control type and the operating rods being carried under the floor. Each generator switch is placed in a separate compartment, the outgoing leads passing through a slab to the current transformers immediately above; then through the concrete barrier to knife disconnecting switches, from thence to the bus-bars. Great care has been taken to isolate the individual apparatus for each unit, also the bus-bars, so in the event of failure of an oil switch or similar trouble, the same is altogether localized and the possibility of an arc spreading over the whole high tension system is completely eliminated. The generator switches, as well as the line switches, are equipped with time limit relays operated from the exciter bus-bars. The main bus-bars are carried in concrete cells arranged on the upper part of the high tension chamber extending the full width of the same. The out-going leads are taken from the main bus-bars through two oil switches, from there through the ceiling of the high tension chamber to the choke coils and line disconnecting switches.

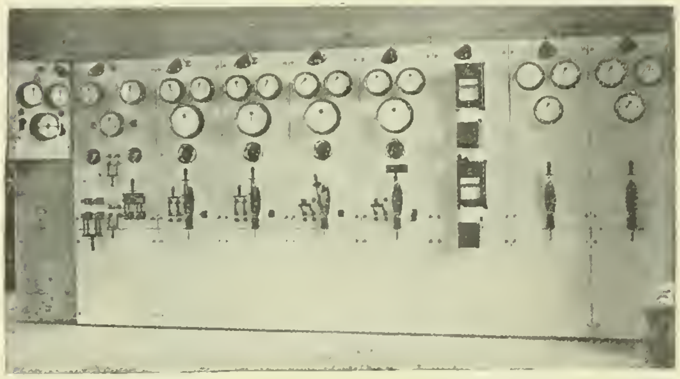


Fig. 10.—Switchboard—Cobalt Power Company.

The totalizing panel is equipped with one polyphase recording watt-meter of the curve drawing type, from which double load on the station is recorded. There is also supplied on the same panel one recording volt-meter of the curve drawing type.

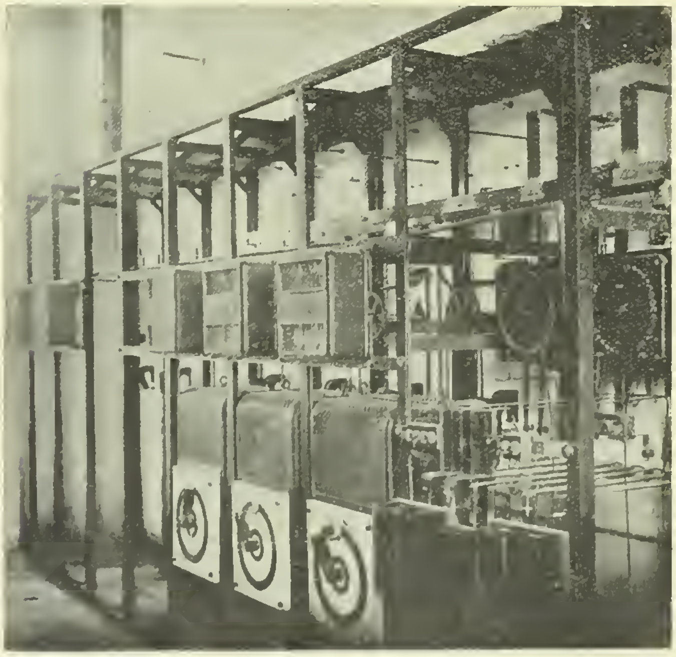


Fig. 11.—Rear of Switchboard -Cobalt Power Company.

Lightning Arresters.

On the second floor of the high tension chamber, the lightning arrester equipment is installed. Two sets are supplied for each line, one set being of the well known G. E. multiple gap type, the other the horn gap. The horn gap arresters consist of two gaps in series equipped with shunt and series water resistance. The past summer has been conspicuous for very severe electrical storms, but no interruption to the service has been occasioned from this cause. Disconnecting switches are supplied for each set of lightning arresters, by means of which they may be isolated from the line for inspection and cleaning purposes. The lines leave the building through the end wall by means of wall insulators manufactured by the Locke Insulator Company. Immediately outside the exit the strain is taken up by a heavy wrought iron structure on which are mounted standard type line insulators.

Great care has been taken in laying out the equipment in order to obtain a simple reliable installation and one which may be easily operated.

The power house is lighted by means of enclosed arc lamps, supported from wrought iron brackets fastened to the side wall, the current being supplied from the exciter bus-bars. The power house is equipped with one 20-ton travelling crane arranged to serve the whole building from end to end. This has proved a valuable feature in the installation work, and is of sufficient capacity to handle the heaviest lift required.

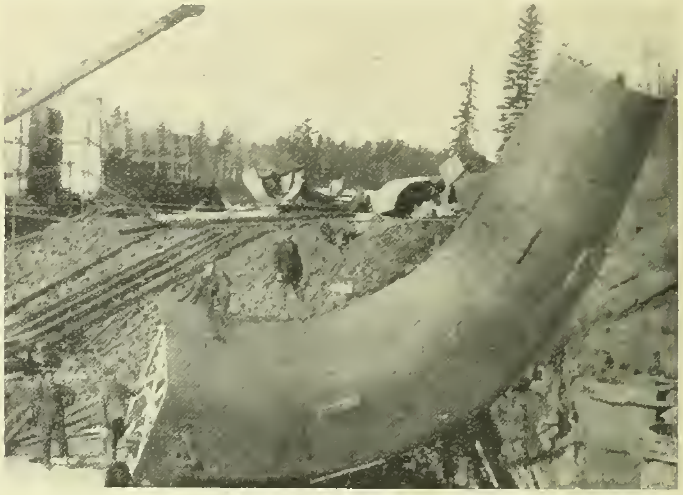


Fig. 12.—Framework for Construction of Concrete Draft Tubes—Cobalt Power Company.

The Turbines.

The turbines, seen in cross section in Figs. 7 and 8, were supplied by the William Kennedy & Sons, Owen Sound. They are Francis type, vertical shaft, 1,335 horse power on a 32.5-foot head, at 150 revolutions per minute, and are direct connected to the generators. Each turbine chamber is supplied with a gate 10 feet by 15 feet, with by pass and gate lifting apparatus, as well as two stop log checks. Each generator turbine is supplied with a concrete draft tube (Figs. 7 and 12), designed to give 20-foot drop. The exciter turbines have steel draft tubes for about the same head (Fig. 8). Each turbine unit is regulated by the Italian governor, manufactured by Riva & Company, Milano, a design which is giving excellent satisfaction.

Transmission Line.

The main transmission line is a straight run from the power house to Cobalt and is about seven miles long. Where it passes through timbered country a right-of way 125 feet wide has been cut and cleared. This line consists of two 3-phase lines of No. 3-0 stranded copper. The poles are of cedar, unusually straight and large, averaging 30 to 35 feet in length with 8-inch tops and placed about 85 feet apart. The insulators are mounted on the cross arms with malleable iron saddle pins (Fig. 13), and are designed for a working pressure of 27,000 volts. The cross arms are of Georgia pine, and painted. The usual wire for lighting protection runs along the peak of the poles and is grounded every fourth pole.

From this main line feeders are taken off at different points to supply the out-lying mines. Some of these feeders are about five to six miles long. The feeders are of No. 2 hard drawn copper, and in each case consist of two 3-phase lines.

The telephone system between the power house and the central office in Cobalt is carried on the main pole and below the lower cross arm. The line is transposed every third pole and no trouble has been caused from induction, the system being clear and distinct at all times.

Sub-stations.

On October 1st, 1909, the complete sub-station equipment was placed with Messrs. Kilmer, Pullen & Burnham. This contract consisted of nineteen complete sub-station equipments, varying in capacity from 60 to 600 horse power, the majority of them, however, being about 300 horse power. Each sub-station equipment consists of two 3-phase lightning arresters of the water resistance, horn gap type with disconnecting switches, three 11000 to 550/2200-volt oil insulated, self-cooled, step-down transformers, one switchboard panel for the control of the transformer secondaries, having mounted on it one polyphase intergrating wattmeter and one 3-pole, automatic oil circuit breaker.

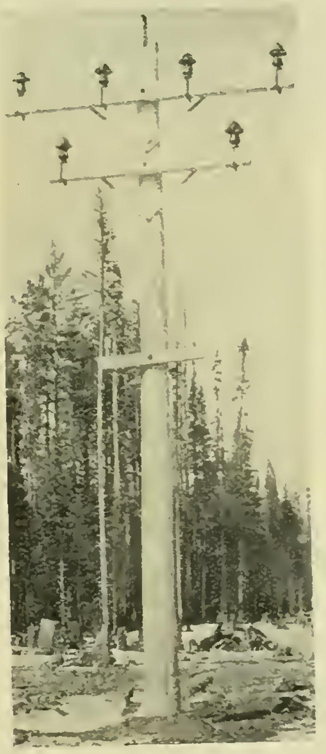


Fig. 13.—Typical Transmission Pole—Cobalt Power Company.

At each mine supplied by the Cobalt Power Company, a small sub-station is built outside the mill to install this equipment. The switching arrangement of the sub-stations is such that any sub-station can be placed on either one of the transmission lines without interfering in any way with the service. This has been found a valuable feature in the event of making line repairs and the possibility of isolating certain portions of the load.

The construction work was carried on under very severe conditions, owing to the fact that the bulk of it was done during the winter, and great credit is due to the various contractors for the manner in which these difficulties were met and overcome. The plant was put in commercial operation early in April, 1910, and since that time has been in continual operation, supplying power without any interruption to the service. The first unit was started up in a temporary structure before the power house was completed, a temporary switchboard being provided in one of the chambers off the thrust deck. The various customers of the power company were supplied by these means for a period of six weeks. At the end of that time the power house building was finished and erection commenced on the second two units and switchboard.

Personal Mention

Mr. John Christie, well known in the electrical trade in the Maritime Provinces, has been appointed travelling representative of the electrical supply department recently opened in St. John by the St. John Railway Company.

Mr. D. P. Roberts, until recently city electrician for London, Ont., has resigned to accept the position of electrical expert and inspector for the British Columbia Government. On the eve of his departure Mr. Roberts was presented with a very flattering testimonial of the appreciation in which he himself personally, as well as his work, was held by the city officials.

Mr. M. O. Robinson, superintendent of the C. P. R. power house at Fort William, has been appointed manager of the Port Arthur and Fort William Street Railway, succeeding N. C. Pilcher.

Mr. J. R. Blackett, formerly chief auditor of the Dominion Coal Company, has been appointed controller of the Halifax Tramway Company. Mr. Blackett will take up his new duties at once.

Mr. N. C. Pilcher, of Port Arthur, Ont., has been appointed manager of the street railway at Sherbrooke, and will take over the work at once. The new manager has been superintendent of the street railways of Port Arthur and Fort William for two years.

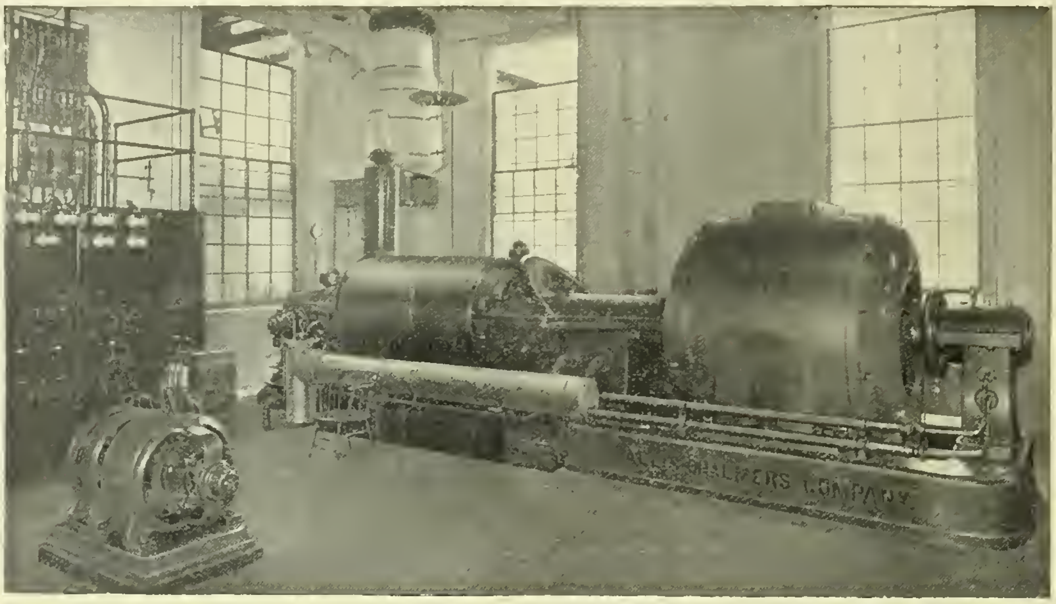
Mr. J. Buntzen, a director and former general manager of the British Columbia Electric Railway Company, is paying a business visit to Vancouver. Among other matters Mr. Buntzen will report to the English Board on the proposed 100,000 h.p. development at Chilliwack and Jones lakes. Mr. Buntzen has stated that he believes the success of his company, the securities of which are held chiefly in the mother land, has been largely instrumental in securing British capital for many other Canadian enterprises.

Mr. Fred. Nicholls, Jr., son of Mr. Frederic Nicholls, general manager of the Canadian General Electric Company, was married on September 15th to Miss Mae Hennessey, daughter of Major Hennessey, of Lynn, Mass. The honeymoon is being spent abroad, after which Mr. and Mrs. Nicholls will reside in Toronto, where Mr. Nicholls' business interests are centered. Mr. Nicholls is secretary of Factory Products, Limited.

Obituary

The town of Galt, Ont., in the death of Mr. Hugh McCulloch, Sr., loses its most noted citizen and one who has been chiefly responsible in the development of the well-known Goldie, McCulloch Company of that town. The late Mr. McCulloch was a native of Ayrshire, Scotland, but has resided in Galt since 1851, and during all these years has taken a keen public interest in whatever has interested his own town. On the school board, with the council, and in the church, as well as in his own well-managed business, he has been a valued and constant worker. In electrical matters, Mr. McCulloch showed his interest, and his faith, by assisting in the organization of the Galt, Preston & Hespeler Street Railway Company, and by occupying the position of its president for many years.

The many friends will learn with deep regret of the death from typhoid of James H. Gunn, the eighteen year old son of Mr. James Gunn, superintendent of the Toronto Street Railway.



750 k. w. Turbo-Generator—Canadian Western Lumber Company.

The Canadian Western Lumber Company

Equipment Operated by Electricity—Power Generated by Steam Turbines—Motors for Individual Machines—Electric Lighted Throughout

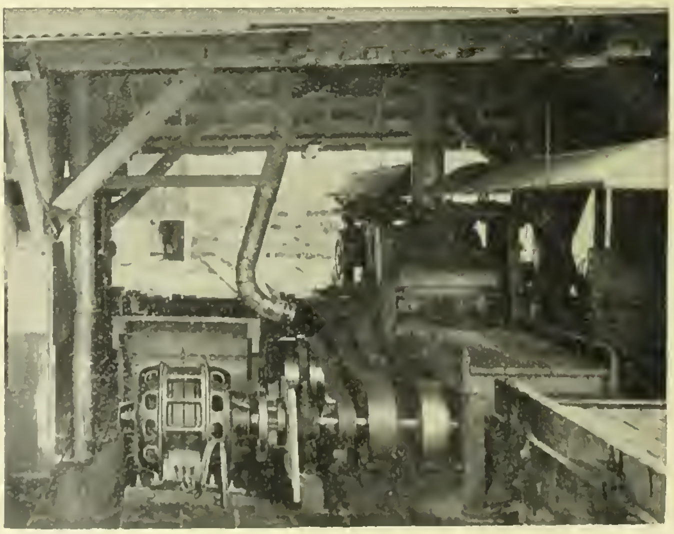
When the output of a British Columbia sawmill averages 350,000 feet of lumber every ten hours, and is capable of being speeded up to 450,000 feet at a pinch, the fact stands for an immense plant and a superb equipment, representing every aid that mechanical genius has devised and made applicable for the speedy and economical transformation of forests into merchantable lumber and kindred products.

Such a plant is that which the enterprise and wealth of the Canadian Western Lumber Company, Limited, formerly the Fraser River Lumber Company, has created on the banks of the noble Fraser, about two miles above the old and historic city of New Westminster. Here is to be found one of the most modern sawmill plants on the American continent, together with a model town comprising the homes of the five hundred employees and the various company buildings—office, stores, hotel, clubhouse, post office, etc. The town possesses both water and electric light systems, and at night the brilliancy of the illumination betokens a flat rate and an abundance of current.

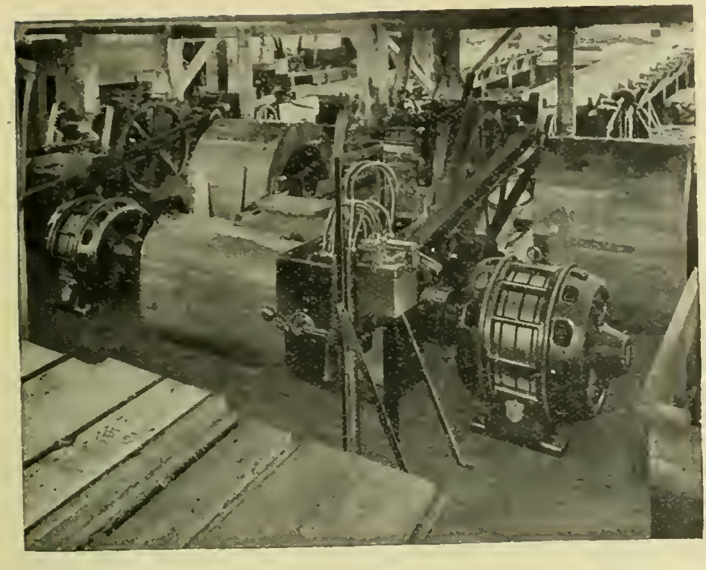
The immense three-storey sawmill stands on the river bank, adjoining 1,200 feet of deep water dockage having a depth of 100 feet. Here ocean vessels take on cargo for all parts of the world, while on the land side a few feet away are spur tracks for the shipment of lumber by rail to the prairies and Eastern Canada. From morning till night, week in and week out, a never-ending procession of huge fir, hemlock, spruce and cedar logs pass up the jack-ladder at the north end of the mill, groan and shudder as they meet the remorseless, keen-toothed saws, and emerge farther on as a multitude of boards, which are swept away by rapid action chain carriers to the sorting table—just in time to afford room for other floods of boards vomited from the saws. These saws comprise two 9-foot Allis-Chalmers Company double-cutting bands, one 11-foot single-cutting band, and a 60-inch Wickes gang fitted with 52 saws, turning out 52-inch boards at one operation when timber of sufficient size is fed to it. One of the carriages is capable of handling long timbers up to 120 feet. There are also two A. C. Co. edgers, a double 84 by 10, and a single 60 by 10; one 40-foot trimmer carrying 20 saws; one 50-foot fuel-slasher; and one 44-inch trimmer carrying 22 saws. The saws on the trimmers are operated with Sumner Iron Works compressed air lifts. There are also two 66-inch Mershon re-saws in operation on the sorting table. The slabs and other refuse from the trimmers drop onto conveyors running to a huge steel-jacketed burner, the stuff fit for firewood being removed while en route by men stationed at convenient points.

The lath mill in connection has a capacity of 50,000 lath or 12,000 1 x 3-inch fence pickets in ten hours. The equipment comprises a Peterman gang bolter and lath stripper built by the Schaake Machine Works, of New Westminster.

The common lumber, after passing over the sorting table, is taken care of by two Stetson-Ross sizers and two No. 24 15-inch



50 h. p. Motor Coupled to Stetson-Ross Sizer.



Two 50 h. p. Motors direct connected to 15 in. Matchers.

Wood Company matchers; the clear lumber is all kiln-dried in eight standard kilns each 20 x 120 feet, with a combined capacity of 125,000 feet per day, before passing through the planing mill and on to the colossal drying sheds, 1,200 feet long and 100 feet wide, with a capacity of 7,000,000 feet. Here the various grades are carefully assorted and stood on end ready for loading into cars on either side of the building.

Only common lumber is piled in the yards, which at present contain about 25,000,000 feet, and before spring may hold 50,000,000 feet. The yard embraces thirteen broad plank alleys, each 1,400 feet in length, and five of 700 feet feet, opening off the main plank roadway leading up the centre from the office to the mill. The driveways and lumber piles rest on cedar piles driven by the company's machine, so that the winter rains cause no inconvenience or loss.

Where the Power is Generated.

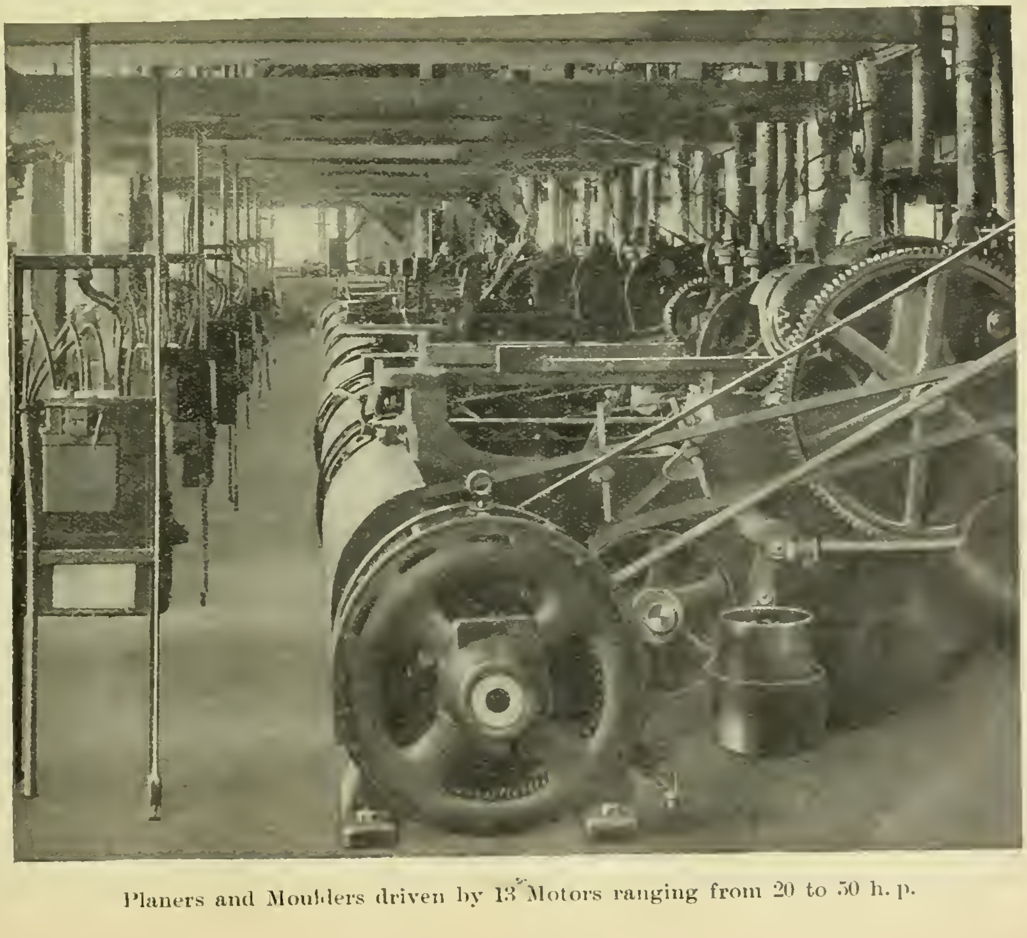
The boiler and engine rooms, which supply life and energy to the big plant, are interesting places to visit. Steam is furnished from a battery of sixteen 72 x 18 tubular boilers with Dutch oven setting. Only twelve of these are used in summer, but the full number is necessary in winter, owing to the loss in radiation and the extra stiffness of the mill machinery. The furnaces are fed automatically, the fuel being sawdust and planer shavings.

The fireproof engine room is large and well arranged. The fine plant comprises one pair Allis-Chalmers Company Corliss twin engines, 22 x 42 inches; one pair A. C. Co. Corliss twin engines, 18 x 42 inches; one 24 x 30 slide valve Hamilton engine; and one 750 k.w. steam A. C. Co. turbine generator, separately excited by a 15 k.w. steam set and motor driven exciter set. The indicated power of the above (including a 24 x 30 inch slide valve Hamilton engine used in operating the gang), is 4,000 horse power. The main drive belt is 60 inches in width, 3-ply, 172 feet long, and was manufactured by Sadler & Haworth, of Montreal. The turbo-generator is a beautiful machine, automatic and self-oiling, and since its installation has not given a moment's trouble. Visitors to the engine room invariably comment upon the absence of the slightest vibration—only a low hum indicates that the huge machines are in operation. This result is achieved by the use of immense cement buttresses and piers planted deep in the ground. The 750 k.w. turbo-generator is guaranteed to operate satisfactorily with a 25 per cent. continuous overload, and is therefore capable of developing 1,300 h.p. The load at present is about 600 k.w., or 750 h.p. This operates all machinery outside the sawmill proper.

Electrically Driven Individual Machines.

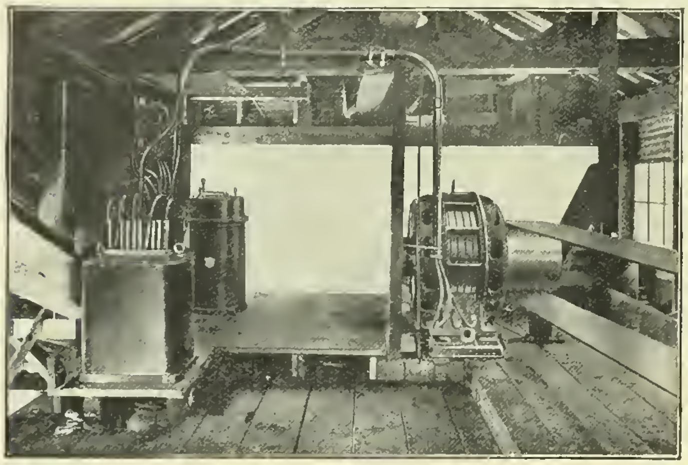
The Canadian Western Lumber Company is the only big concern in Canada operating the full equipment of planers, moulders, sizers and fans with electric power furnished by direct-connected motors. Two 2½-inch conduits carrying six 350,000 circular mil cables reach from the power house, a distance of 600 feet, to the green lumber sizers and ship-lap machines on the sorting table. The wires carry current to one 75 h.p. motor driving a huge fan; two 50 h.p. motors direct-connected to two Stetson-Ross ready sizers; one 40 h.p. motor driving chains and rolls and chain on sorting table; two 40 h.p. motors direct-connected to shiplap machines; 50 h.p. motor driving fan and chains and back rolls carrying lumber to and from the machines; 5 h.p. motor driving the cut-off saw; and another 5 h.p. motor driving the chains at extreme end of sorting table.

The planing mill is a delight to the eye of the visiting lumberman and electrician, being the only electrically operated plant of its size in Canada, and is not excelled in its equipment or number of machines by any mill in the United States. The building is 220 x 150 feet in size and on the work floor in one long row stand thirteen Berlin and Woods matchers and moulders, four of the machines being the new fast feed type—two 94X Berlins and two No. 22 Woods. In addition there are one



Planers and Moulders driven by 13 Motors ranging from 20 to 50 h. p.

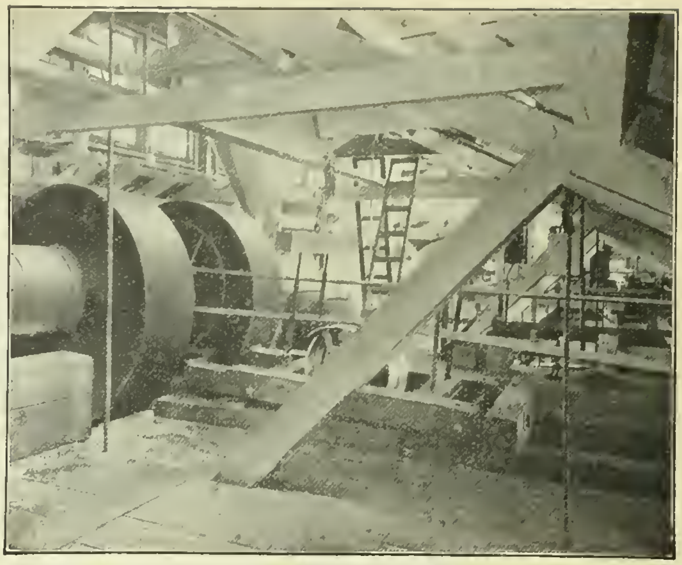
40-inch band ripsaw, one 6-inch band resaw, one small circular ripsaw, and one cross-arm borer and rounder.



150 H. P. Motor, with Controller, Driving Fan.

Two 3-inch conduits carrying six 500,000 circular mil cables lead beneath the loading gangway a distance of 800 feet to the planing mill, furnishing current to the numerous motors. One 50 h.p. motor drives a large double fan which sucks the shavings from nine machines; another 50 h.p. motor drives a single fan that collects the shavings from two planers, the cross-arm machine, resaw and rip saw, depositing them in the pipe connecting with the double fan; and a 20 h.p. motor drives a fan taking the shavings from three moulders; seven 40 h.p., three 50 h.p. and two 20 h.p. motors, direct-connected, operate the matchers and moulders; one 50 h.p. motor drives the band resaw; one 20 h.p. motor, the band ripsaw; one 10 h.p. motor, the cross-arm machine; one 10 h.p. motor, the circular ripsaw; two motors, 15 h.p. and 10 h.p., operate the sixteen trimmer saws.

The motors are all protected with oil circuit-breakers. In the second storey of the building is a junction box, 14 x 9 x 4 feet, asbestos and iron lined, with front and rear openings. The box contains individual switches and fuses for each motor, and a similar safeguard is provided for the motors driving the machines in use on the green lumber sorting table, in this case the junction box being located beneath the platform. Separate conduits lead from the junction boxes to the various motors.

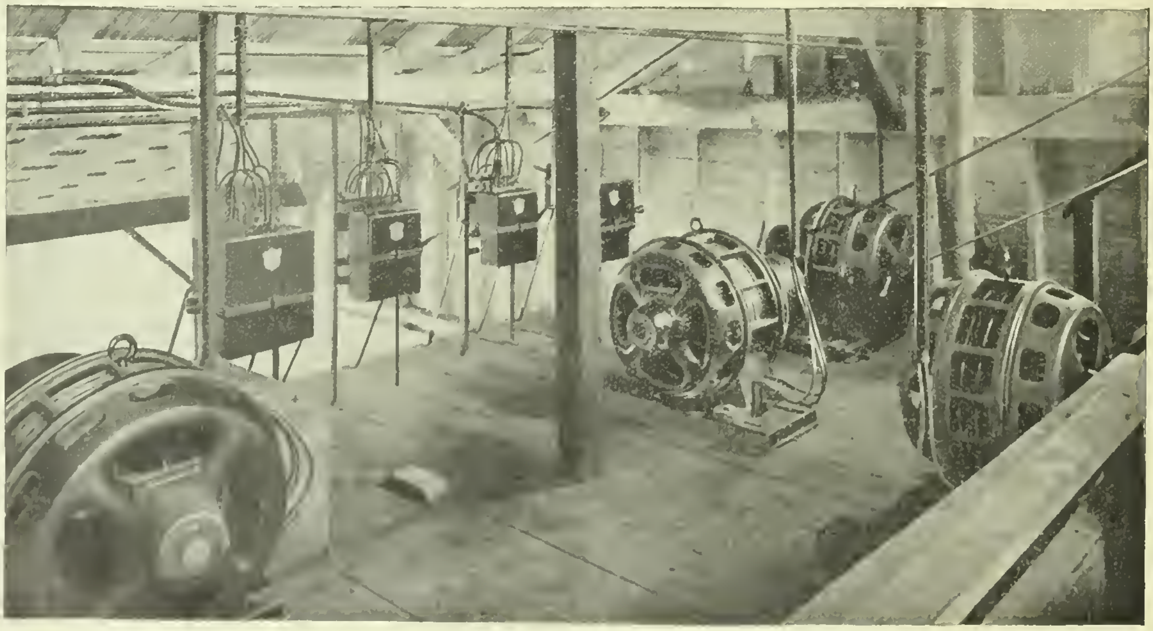


Double 80 in. Great Western Exhaust Fan, driven by 150 h. p. Motor.

Other motors in use about the plant are one 10 h.p. driving the wood conveyor; one 5 h.p. driving the blower in connection with the engine room ventilating system; one 5 h.p. operating the filing and grinding room machinery; and one 5 h.p. operating the air compressor system used in dusting the motors. In all, the motors at present in use number 38, and were supplied by Allis-Chalmers-Bullock, Limited, of Montreal, through their Vancouver office.

Will Soon Add Low-Pressure Turbine.

Plans are now being finally revised preparatory to starting work on a new cedar lumber and shingle mill and sash and door factory, which will likely be in operation by the first of the new year. The cedar mill will have a daily capacity of about 100,000 feet, and will be equipped with two 9-foot double cutting bands, with an edger, slasher and trimmers. The shingle

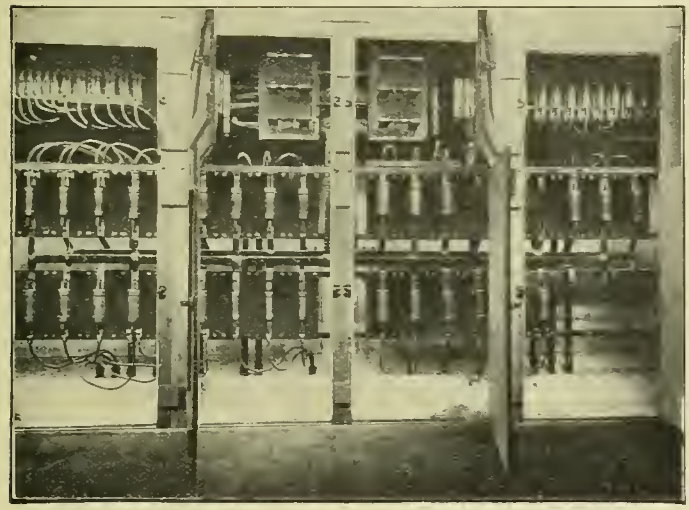


Arrangement of Motors on an Intermediate Floor. In the centre a 10 H. P. Motor Belted to 60" Great Western Exhaust Fan. The others are: 20 H. P. Motor driving a Band Rip Saw, 40 H. P. Motor driving a Band Saw and 20 H. P. Motor driving a Cross Arm Pounder and Borer.

mill in connection will have twelve upright shingle machines, with a capacity of over 360,000 shingles daily. There will be four 20 x 120 dry kilns to take care of the cut. The sash and door factory will have the enormous capacity of 1,000 doors in 10 hours, and will, of course, be equipped with the latest and best machines known to the trade. Both of the new plants will be electrically driven throughout, the power being furnished by a new 1,000 k.w. low pressure Allis-Chalmers Company turbine generator to be installed in the present power house. The new turbine will use the exhaust steam from the Corliss engines, which will be a great economy.

The Electric Lighting Plant.

Three 15 k.w. step-down transformers are used in connection with the mill lighting plant and boiler and engine room re- rent through step-down transformers for the lighting of the quirements. while three 35 k.w. step-up transformers supply cur- planing mill. sorting tables, machine shop, lumber sheds, yards, company buildings, private residences and streets. In all, current is supplied to about 2,000 incandescents and 17 arc lamps, most of the street lights being tungsten lamps of 100 watts capacity. A direct current 15 k.w. generator in the boiler room of the mill supplies current to about 200 incandescent lights for the pilot circuit.



Secondary Distribution Panel Box from which Conduits lead to the Planers and Moulders.

New Lumber Handling Device.

There is now being erected an electric travelling crane which will operate on tracks laid on the 1,200-foot platform paralleling the deep water dock on the one side and the common lumber car loading track on the other. The crane, which will weigh about 55 tons, will stand on a car 26 x 80 feet in size, moving on four standard gauge tracks. It will have a mast 60 feet in height, from which will project a steel boom 105 feet in length. Three motors of a combined capacity of 110 horse power will be required for the proper operating of this powerful new loading device, which will handle timber and lumber with amazing ease and quickness. A 60 h.p. motor will operate the car, moving it 600 feet per minute if required; a 40 h.p. motor will manipulate the hoist line; and a 10 h.p. motor will be used for slewing the boom. This powerful machine will be capable of handling 200,000 feet of timber or lumber in 10 hours, the haul averaging 1,000 feet. The crane was designed and is being constructed by R. L. Hunter, of Seattle, and is the largest of its kind on the Pacific coast. The only one that approaches it in size is used by the St. Paul & Tacoma Lumber Company, of Tacoma, Wash., which has a wooden boom only 100 feet long, while the crane is stationary . Only two men will be required to operate the more modern machine, which is expected to displace eighteen men and one horse.

Modern Fire Protection System.

The mill buildings and yards are protected by a complete modern water system, the supply being secured through a 10-inch main from Lake Como, two miles distant, at an elevation of 450 feet. The system comprises 50 hydrants, the pressure obtained being 130 pounds to the square inch. Hose stations are located at intervals throughout the plant and yards, and the protection is to be further augmented by two powerful 1,000 gallon Knowles Underwriters' fire pumps. The powerful pumps of the tug Senator Jansen also afford protection to the mill and waterfront property when the vessel is in port, and it is also proposed to connect the main with the hollow steel boom on the electric travelling crane, which would give a five-inch stream of tremendous effectiveness. Fire practice is held regularly in order that the men may become proficient and know just what to do in a time of emergency.

Officials and Employees.

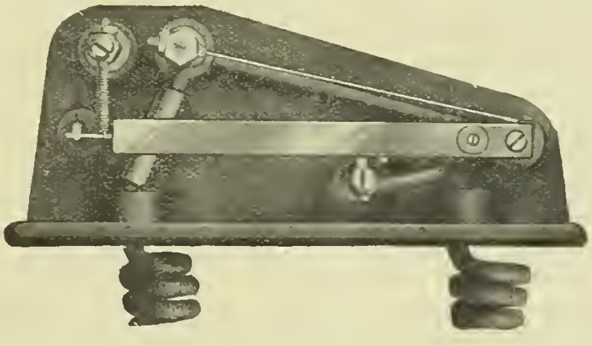
The Canadian Western Lumber Company is officered as follows: Col. A. D. Davidson, president; A. D. McRae, vice-president and general manager; Jas. D. McCormack, secretary-treasurer; F. E. Burk, assistant secretary-treasurer; W. S. Rogers, manager of manufacturing; J. H. Mackin, sales-manager; Thos. McLarty, manager logging department; Charles Richter, electrician.

Electrician Richter has a treasure in the form of a portable Westinghouse polyphase watt meter fitted with potential and current transformers, which he uses for making power tests on motors. By means of it he can tell in a moment just how much work a motor is doing. Supplies for all motors are kept in stock.

Including the men engaged in the mill and the company's lumber camps, the total number on the payroll totals close to 900, to whom between $60,000 and $70,000 is paid out monthly. The mill payroll alone calls for about $45,000 monthly.

The Henry-Thermo Instrument

The Henry-Thermo instrument which is being put on the Canadian market by the Federal Engineering & Supplies Company, and manufactured at Lennoxville, Que., bids fair to prove a most satisfactory instrument for controlling flat rate electric light consumers. An illustration of the inside construction is herewith shown. What chiefly commends the instrument is its simplicity and low maintenance cost. There are no solenoids in connection with it, and there is no shunt wire across the make and break contact which will allow the current to flow when the circuit is supposed to be open. In this operation, a wire under tension, called the Thermo Wire, holds the contact closed. Opposing this Thermo Wire under tension is a small spiral spring which opens the circuit as the Thermo wire expands. The only part of the instrument liable to burn out is the Thermo wire, which only costs five cents. The instrument can be used both out-doors and indoors. It has been found by experiment that parties contracting for a small load, say 2 or 3 amperes, cannot heat an iron when the circuit is protected by the Henry-Thermo instrument, as the circuit will not remain open long enough to heat such apparatus.



Electrical Activity in British Columbia

Victorians Do Not Want Wires Underground.

While the citizens of most of the cities and towns of Canada are striving to devise plans to bring about the burying of telegraph and telephone wires and the removal of the forest of poles from the leading thoroughfares, the good people of the British Columbia capital appear to think that the tall masts and their tangle of wires constitute an ornament and an attraction for tourists. At any rate, they have just rejected what appeared to be a grand opportunity to have the leading thoroughfares cleared of the above impediments without cost to themselves, yet they refused to vote for the necessary by-law in sufficient numbers to give the necessary legal authority.

To explain the situation as briefly as possible, we may point out that from time to time the telephone company was approached by past councils to bury their wires, but nothing was done. Last year extensive improvements in the way of street grading and paving were planned, and it was felt that the time had arrived for decisive action. Under the general statute the only way the city can force the company to remove their poles is for the city to build the underground system, remove the poles and transfer the wires to the conduits, all at its own cost. This would, of course, entail an almost prohibitive expense. But the telephone company requires a new central station, and it was realized that it could just as easily be fitted for an underground system as for the overhead kind. Negotiations were again undertaken, and an agreement was arrived at whereby the company agreed to assume the expense of burying all wires in the business section of the city. The plan was for the city to loan the company $100,000, by handing over debentures for that amount running fifty years. These debentures the company would sell for whatever price possible, assuming any discount. The ownership of all wires, conduits, etc., was to remain with the city during the life of the debentures, which were to be handed over in lots of $25,000 on the certificate of the city electrician or engineer that work to that amount had been done in each case. In the meantime the city would pay the interest on the bonds and establish a half-yearly sinking fund, but six days before the city had to make a payment thereon, the exact amount would be paid into the treasury by the company, the latter being allowed the use of the system without rental so long as the payments were kept up. In the event of default the city could take possession, and either operate the system itself or hand it over to another company.

Under this agreement the citizens of Victoria could look forward to the time when every telephone pole on the city streets would be removed at no cost to their pockets. However, the prospect did not appeal to them.

New Power Company's Transmission Lines.

The Western Canada Power Company at Stave River, some 40 miles east of Vancouver, are about to proceed with the erection of transmission lines so that they may commence supplying power and light as soon as the first unit of the plant is in operation. The company have purchased a right-of-way 100 feet wide from the site of the plant to connect with the main road, which will be followed to Westminster Junction, a distance of 17 miles. From the Junction the lines will proceed to the company's sub-station in Burnaby municipality, between New Westminster and Vancouver, from which point the distribution of power for this section will take place. The high power wires of 60,000 volts, will be carried on tall steel towers, which will arrive in a couple of months. Thirty-five miles of heavy copper wire have been ordered from the Dominion Wire & Cable Company and Dominion Wire Manufacturing Company, a 300-ton shipment, the first consignment of which has already arrived from the East. A pole line will follow the high transmission system, carrying wires of 12,000 volts, the current being stepped down to 2,000 volts for local distribution en route. The poles and steel towers will carry duplicate telephone systems between the plant and sub-station in order to preclude the possibility of interruption.

Mr. C. H. Cahan, of Montreal, president of the Western Canada Power Company, proprietors of the Stave Lake plant, is here at present making an inspection of the development work on the big plant, which is rapidly approaching completion. Mr. Cahan is well satisfied with the progress being made by General Manager Heyward and Assistant Manager McNeil, and is confident the company will be ready to furnish a large complement of power during the early part of the coming year. When ininterviewed respecting the measure of support looked for, President Cahan said: "We have spent $3,000,000 on our plant now, and this alone ought to be an indication of our faith in the possibilities of this city. We feel that we are as much a necessity to Vancouver as the city is to us, and that by working in conjunction both can prosper. At the present site we can develop about 50,000 h.p., while at the lower site we can develop the same amount of electrical energy. By the present insulation at the plant now under construction we can develop 30,000 h.p. and will be ready to supply that amount to this city."

Installation of New Street Lights Delayed.

It now looks as if some months may yet elapse before the much talked of new system of ornamental street lights will illumine Hastings, Cordova and Georgia streets and Westminster avenue, owing to the unwillingness of a few property-owners to sign the necessary agreement with E. A. Earle & Company, the promoters. Hastings street owners are willing to have the system proceeded with at once, but it is desirable that the work be not done in piecemeal fashion, hence the tardiness of a few is preventing the carrying out of what is bound to be a most effective advertising scheme as well as a striking improvement. Messrs. Parr & Fee, who have the Granville street system in hand, are likewise being held back by the refusal of a few owners to rise to the occasion, but the work is being proceeded with in the belief that the "kickers" will see the error of their ways in the near future. A number of the standards are already in place, and in all probability that thoroughfare—which many think is destined to be the city's leading retail street—will be the first to show the new and handsome lights. In the meantime some of the new style of lamps are to be installed on residential streets, the owners of three apartment houses having obtained permission to erect Seattle standards on condition that the city type be substituted when the streets on which the buildings are located are lighted throughout by the ornamental system.

Monthly Interests Costing Half a Mililon.

Mr. J. Buntzen, a director and formerly general manager of the British Columbia Electric Railway Company in Vancouver, is at present here for the purpose of making an inspection of the improvements and extensions under way, and will also look into the project for developing 100,000 h.p. at Lake Chilliwack, preliminary work on which has already been commenced. In the course of an interview with the representative of THE CANADIAN ELECTRICAL NEWS, Mr. Buntzen said:

"The board is willing and anxious to improve the service, in fine to keep pace with the growth of the city and district and expend money if there is a reasonable chance of securing a return on the investment. And bear in mind, we do not look for any immediate return in outlying sections. We have no difficulty of securing capital provided the investment will ultimately turn out profitably. Our current expenditure for extensions and improvements now average about $500,000 a month. That is one reason why the merits of every proposition must be carefully investigated and why short term franchises are not regarded with favor by the British investor.

"Of course, our company has shared in the general prosperity which has prevailed on the coast for the past few years, but it had its dark days. From 1890 to 1899 the Vancouver city line did not pay one cent in dividends, and now after four years the North Vancouver line still fails to pay operating charges. But we are not discouraged, as the future will place the account on the right side of the ledger. Our expenditures on improvements are now 300 per cent. larger than they were three years ago. These figures will go on increasing every year. There is ample capital available for legitimate propositions, but London bankers scent wildcats from afar. I really believe the success of our company has been very largely instrumental in securing British capital for many Canadian enterprises."

Twenty Thousand Horse Power for Prince Rupert.

The Tsimpsean Light & Power Company is the name of a corporation that is planning a great electrical power development for Prince Rupert, Manager R. Brutinal asserting that the shareholders are prepared to expend several million dollars in the next few years. The company claim to have the only water power within a radius of 70 miles of the city that is of any commercial value, and they propose to expend $1,000,000 on a dam and on initial development of 20,000 h.p. Electric energy will be offered to the city in block at a price which will enable the corporation to dispose of light and power to consumers and to use it for street lighting at a profit. A street railway is also contemplated, the terms being rather novel. It has been suggested that the company pay to the city a special tax of $15 or $20 per car operated and 3 per cent. per annum of the gross earnings up to $100,000. From that amount up to $300,000 they will pay 4 per cent., and over $300,000 they will pay 5 per cent. In the meantime the company are installing a gas plant costing $160,000.

It is announced that the B. C. E. R. tram line between New Westminster and Chilliwack is to be ready for business by October 1st throughout its entire length of 65 miles, and that regular trams will be run to Westminster Exhibition. Work is now being pushed both night and day by the construction gangs. The opening of the Chilliwack line will mean the completion of the largest single undertaking ever accomplished by the British Columbia Electrical Railway Company; work has been under way for over two years, and the total expenditure involved is about $2,5000,000. During the present summer a portion of the line has been used for regular passenger and freight service. The cars for the new branch are already on hand, and the distance between New Westminster and Chilliwack will be covered in about two hours.

Preparations are being made by the British Columbia Electric Railway Company for construction work on the high cement dam at the mouth of Lake Coquitlam, which will convert that body of water into an immense reservoir for the Lake Buntzen power plant. J. B. Schuyler, an eminent Los Angeles engineer, will superintend the work.

The plans of the Pacific Exploration Company, of Nelson, B.C., for the erection of a large electric power plant on the Pend d'Orielle river, are now before the Provincial Government for approval. The company proposes to furnish power to the Pend d'Orielle valley, Sheep creek, and Ymir, Orient, Chewela and Melatine districts, as well as to the Northport smelter on the United States side of the boundary. The president of the company is H. C. Hall, of Nelson; manager, J. W. Falls; secretary, A. Y. Lorch. Nelson men are largely interested, and it is rumored that the C. P. R. is at the back of the enterprise, and that a portion of the power will be applied to the electrification of the Crow's Nest line. It is proposed to develop 25,000 h.p. at the outset, with provision for doubling.

There is general commendation of the government's action in creating the new office of provincial inspector of electrical energy, and appointing thereto Mr. D. P. Roberts, late chief electrical engineer of the city of London, Ont. Since the adoption of the legislation of last session providing for official and authoritative inspection of electrical plants, rolling stock, etc., the government has been seeking the right man for the position, it being essential that he should be an expert of unquestioned ability and, if possible, a stranger to the operating companies and electrical interests of the province. The appointment of Mr. Roberts was made on the recommendation of Hon. Adam Beck, Ontario's so-called "Minister of Power."

The Vancouver branch of the Canadian General Electric Company is now established in commodious new quarters at the corner of Pender and Seaton streets, having outgrown the former Granville street premises. The new building affords 20,000 feet of space, two floors and the basement being occupied. The first half of this year was the biggest in orders that the company has ever had. Mr. H. Pim, the veteran manager, also directs the affairs of the Canada Foundry Company, the plant of which is located at Peterborough, Ont.

Vancouver was visited on August 29th by the members of the Northwest Light and Power Association, the party arriving on the steamer Queen from Tacoma. They were welcomed by General Manager Sperling and other officials of the British Columbia Electric Railway, the observation car being boarded for a trip around the city. Next morning the visitors, numbering about 140, were taken for a trip around Stanley Park in tally-hos, and later witnessed a special call of the fire department. The convention left the city in the afternoon by steamer for Bellingham, Anacortes, Everett, Seattle and other points.

By a vote of 179 to 9 the citizens of Prince Rupert recently declared in favor of acquiring the local telephone system at a cost of $40,000. Twenty shareholders are interested.

The China Creek Water Power Company is completing plans for the development of electrical energy for street lighting and industrial purposes in New and Old Alberni, Vancouver Island.

Mr. J. V. Armstrong, secretary of the British Columbia Electric Railway, returned from a holiday trip spent in the Chilliwack district, where he enjoyed some fine trout fishing.

The city council of Victoria is taking a wise step in empowering the present inspector of electric lighting to oversee the wiring of all buildings, including those under construction. Insurance men are of opinion that much work is being done by amateurs, with resultant risk of fires occurring.

At a meeting of Vancouver council, held September 12th, Mr. Woodworth, representative of the Automatic Phone Company, was severely rebuked by Mayor Taylor for alleged erroneous statements made in a letter to the press relative to the hostile attitude of some of the aldermen, and the reasons therefor. The course taken is believed to mark the death-knell of the company's application for a franchise for an automatic system, so far as the present council is concerned.

Ottawa Electric Company Office System

Modern Business Inseparable from "System"—A Carefully Thought-Out Plan Initiated and Operated by a Progressive Company

The remarkable growth of the office system in the last few years and its application to so many and varied forms of business and industry, is the natural result of the insistent call for greater efficiency and dispatch in the discharge of business duties, made necessary by the ever-increasing keenness of competition. The installation of such a system generally entails a considerable initial expenditure, but it immediately commences to pay dividends in the time and labor which are saved, the pride of the staff in its up-keep and successful working out, and quite often in the discovery and prevention of leaks hitherto unsuspected. The system recently installed in the construction department of the Ottawa Electric Company is one which has given every saisfaction and reflects much credit upon its originator, Mr. F. Wilson, superintendent of construction, being the result of much thought, and consideration on his part of the requirements of the department.

The filing cabinet is placed in the superintendent's office and contains all the cards relating to transformers, arc lamps and power customers. For lighting transformers the city is divided up into fifteen circuits for convenience and a "circuit book" contains blue prints of each circuit, made from a plan of the city on an enlarged scale. On these the position of every transformer in use by the company, is marked and numbered. A card is made out for every transformer and filed away in the position corresponding to its make and serial number. One, or more, drawers is alloted to each make and the cards in them arranged in order of their serial numbers. On each card is entered maker's name, serial number, style, type and capacity. Below is space in which the first entry made is that of the date and location of the initial installation. Any subsequent change in locaion, with date, is immediately written in, so the chief advantages of the system result from it being kept strictly up to date. A typical list of entries following the rating on any transformer card would be:

February 2nd, 1907.—Installed on ——— street, 3rd pole east of ——— street.

June 23rd, 1909.—Returned to stores from above location.

June 24th, 1909.—Tested O. K.

July 3rd.—Installed on ——— street, 2nd pole north of ——— street.

July 16th, 1910.—Returned to stores, burnt out. Cause: storm of July 15th, 1910. Scrapped.

This card would then be taken out and placed in a separate drawer containing "burn-outs."

When any change of transformers is made by the linemen, they are required to report the serial number, capacity, style, type, etc., of the transformer taken down and the same for the one put up in its place. From this report, the proper entries are made on the cards of thees two transformers. As often as is deemed necessary the cards and circuit-plans are checked up to insure correspondence.

Another set of drawers contains the "circuit cords" which are a check upon the transformer cards. There is one of these cards for each location of a transformer. These cards are "live" as long as the location is not done away with, regardless of how often the transformer at this location may have been changed. These cards are headed: Circuit No. ——; Transformer No. ——. Then follows the serial number, make, style, etc., of the transformer first installed at this location, with date of such installation. When this transformer is taken down a dated entry is made accounting for such and below is written in the description of the transformer replacing the first, with date. When one large transformer is put up to replace two smaller ones, one of the locations is done away with and the corresponding circuit card is then taken out and placed in a drawer containing the "done-away withs" and the dot and number on the map are erased. With this method of double checking it is very rarely that the very latest information regarding any transformer cannot be immediately obtained, unless due to carelessness in handing in or entering the reports.

Power transformers, generally in sets of two, for two-phase supply, have separate plans showing location and set number, and cards giving make, maker's number, style, type and capacity. They are filed away in the order and capacity. They are back of each transformer-set card are the power customers' cards, totalling up the power being drawn from the set. On these cards are recorded the latest power tests made on the cutsomers' motors. For this purpose the city is divided up into five power circuits with a plan and indexed list of customers for each. Single phase power customers are indexed and carded in the same manner. At the end of the month the total number of kilowatts put up, kilowatts taken down and kilowatts burn out, are entered in the monthly statement.

Arc lamp cards occupy several drawers in the filing cabinet. All arc lamps owned by the company are used by private customers, the Municipal Electric Department having taken over the street lighting some time ago. A card is made out for each customer, giving the number and description of lamps used by him. These are kept right up-to-date from the daily reports handed in from the arc lamp department.

For the poles, separate plans of the city are kept, on which dots are placed indicating the position of every pole in use. One plan shows all the poles owned by the company. Other plans are kept, indicating the position of poles owned by the company and used by telegraph, telephone, and other electric companies, as well as of poles owned by each of these companies and used by the Ottawa Electric Company. All changes or extensions are immediately attended to on the receipt of the line foreman's report. The number and lengths of all poles taken down or erected, whether for renewals or extensions is checked up and totalled twice a month, together with the number of poles in the pole-yard, so that it can be found at once just haw many of each length are available.

The linemen and other employees of the company are given every encouragement to consult the cards themselves, thus giving them an insight into the inner workings of the department and tending to increase their confidence in their own ability to accept the responsibility attaching to their individual work. The smoothness with which the system has worked out and the ease with which it is kept up-to-date are the best measures of its success.

Trade papers report that the Canadian Tungsten Lamp Company have registered in the Province of Quebec. Readers of the notice might think that this is a new feature of the Hmailton manufacturing company, when in reality it is only a belated method of proceedure, as their branch on St. Dizier street should have been registered over a lear ago. It is only by a timely warning the Canadian Tungsten Lamp Company managed to get registered before the informer made a rush for his share of the fine levied by the Quebec government.

Companies having branches in the Province of Quebec should be careful to see that they are duly registered, as if not, they are liable to a fine of $200, half of which goes to the informer.

QUESTIONS AND ANSWERS

GENERAL RULES TO BE OBSERVED BY CORRESPONDENTS:

1. All enquiries will be answered in the order received, unless special circumstances warrant other action.
2. Questions to be answered in any specified issue, should be in our hands by the close of the month preceding publication.
3. Questions should be confined to subjects of general interest. Those pertaining to the relative value of different makes of apparatus, or which for intelligent treatment, should be placed in the hands of a consulting engineer, cannot be considered in this department.

Will Meters Do What Is Claimed For Them?

Q.—There are some integrating meters on the market which claim to be capable of measuring polyphase loads, even though they have but one current and one potential coil; also there are some direct current meters which have no potential coils, notwithstanding which they claim to read in kilowatt hours. What do you think of these two types.

A.—A meter with but one current coil and one for potential will measure a polyphase load quite correctly if the load be balanced, but as it is very seldom that one finds a really balanced load, there is every probability that such a meter will have quite a large error when used on commercial circuits. You, of course, understand that the above refers to a meter which has been equipped with a dial having the proper gearing to take account of a polyphase load, that is, it is not intended to say that the ordinary single-phase meter would be correct on a polyphase circuit even if the latter be balanced. It could be used though if you multiplied the reading by 1.73 for a three-phase circuit, or doubled it for two-phase work.

Meters with current coils only, even if equipped with gearing that ostensibly gives a kilowatt hour reading, are correct only at the specified voltage. If the potential be low they record correspondingly fast, if it be high, their reading is below the true energy, and as it is well known that but very few circuits operate at their claimed potential, it will readily be seen that such a type of meter is inherently objectionable. (See question 5 as to the points that determine a balanced load.)

Advantages of Low Pressure Turbines.

Q.—I hear a great deal these days about low pressure turbines. Would you please explain what they are, and what special advantages they have?

A.—A low pressure steam turbine, as distinguished from the ordinary or high pressure design, is a turbine arranged to get its supply of steam from a comparatively low pressure source, generally the exhaust of an ordinary reciprocating engine, instead of taking it direct from the boiler. If the exhaust steam is not always sufficient to carry the load of the turbine, as may be the case if the load on the engines falls at times to a comparatively small amount, the turbine is equipped with a reducing valve that automatically opens at the required time and admits sufficient live steam to make up the deficiency. In such cases the turbine is said to be of the mixed pressure type.

The objects and advantages of the low pressure turbine are simply to get greater output from a given steam consumption, and from the boiler plant which produces it, this in turn meaning greater efficiency and consequently a lower cost of power. This gain in output and efficiency is in many cases so great as to be almost incredible. For instance, under fairly favorable circumstances the exhaust steam from an engine developing, say 1,000 h.p., can be made to produce another 1,000 h.p. if passed through a low pressure turbine, obviously, a wonderful economy, not only in the steam itself, but in the cost of the boiler plant required to produce it. The explanation of such tremendous economy is that a reciprocating engine is not advantageously adapted to work over the wide range of steam and cylinder temperatures which are encountered when taking in high pressure steam at one end, and exhausting to 28 or 29 inches vacuum at the other, besides which the mechanical friction of the very large cylinders required to handle any reasonable horse power of steam at such low pressures becomes a serious item, materially lowering the efficiency of the engine. As opposed to this, the steady non-reversing flow of steam through a turbine results in any given point remaining at a practically unvarying temperature, besides which the design of the machine is such as to make it capable of readily handling very large volumes of steam with but little friction, hence high economy.

Motors Will Not Run Below Half Normal.

Q.—In some of the literature describing variable speed induction motors you often see the statement that the motors described are suitable for operation continuously at any speed between half speed and full speed, but cannot be run continuously at speeds below half of normal. Why is this? I would have thought that if sufficient rheostat capacity were provided, the motor could be run at any point.

A.—The limitation you name is very necessary in all standard machines, the point being that the heating of the rotor goes beyond the allowable point if the machine be operated for any length of time at very low speeds. This heavy heating is due to two distinct causes, first, increased energy to be dissipated, and secondly, decreased means of dissipating even the normal energy which is ordinarily lost in the rotor. The increased energy comes from the fact that the frequency in the rotor is much greater at low than at normal speeds, being proportional to the slip, hence the iron losses are much increased. Decreased facilities for dissipating the heat generated by these losses is due to the lessened ventilating capabilities of a rotor operating at a low speed as compared with one running at normal. The above, of course, applies to standard machines only, as if you do not mind the price, motors can be built to operate indefinitely on any step of the controller.

Overloading Ammeters.

Q.—Will you tell me if it will do ammeters any harm to overload them to the extent of 200 lights for three or four hours?

A.—It all depends what size they are, that is, how much current they are supposed to carry at full load. Most instruments are designed to carry an overload of twenty or twenty-five per cent. without any difficulty, other than the fact that any overload puts the needle off the scale and so destroys the reading. If your meters have a full scale of, say 400 amperes or more, the overload you mention should do no harm, but if they are materially smaller, say only 200 amperes, the chances are that an overload of 200 lights might do considerable damage to the windings.

The question of time in a meter does not matter very much because, the parts being very small and light, they take only a very short time to heat up. Probably half an hour, or less, would warm up the average instrument, whereas large motors or transformers take from two or three hours up to twenty or thirty, depending on their size.

Balanced Load.

Q.—What is the meaning of the term "balanced load?"

A.—In a direct current three-wire circuit it means that the current and voltage of the two sides of the circuit are both equal, that is, the two sides balance one against the other, like a pair of equal arm scales with the same weights in each pan. In alternating work, either single phase three-wire or polyphase, the power factors of the different circuits must also be the same, that is, in a three-phase circuit, the amperages in the three leads must be the same, the three voltages equal, and the three power factors similar, or, if the voltages or amperages differ, or both, the power factors must vary correspondingly so as to make the energy consumption of the three legs identical.

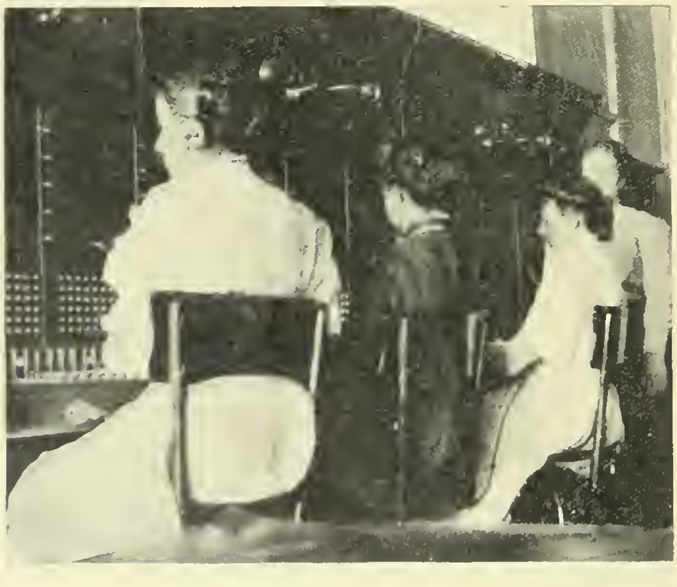
Telephone Progress

Ingersoll Municipal Telephone System — Six Hundred Instruments to Five Thousand Inhabitants—Central Energy Service to Farmers—Sets Aside a Depreciation Fund

Notwithstanding the oft-repeated statements of a few years ago that the telephone was necessary only to the business man and the residents of urban municipalities, the local independent companies throughout Ontario have shown that no section of the people can use the telephone to better advantage than the farmer. It has also been demonstrated by these companies that the telephone is valuable in proportion to the number of rural subscribers who may be reached over the lines of any system. With only an occasional telephone among the farmers, the value of a rural system offers little advantage to the people in any community, but with lines reaching out along every cross road and concession, and with telephones installed throughout the whole neighborhood, few farmers are prepared to forego the benefits of this wonderful instrument.

Probably there is no section of the province in which telephone service is more general or where its benefits are more freely acknowledged than in the South Riding of Oxford. Ingersoll, the principal town of this section, has a population of 5,000 inhabitants. There are within this town 600 telephones in operation—or about one to every eight persons.

This development has been largely due to the action taken by a number of local men who organized the Ingersoll Telephone Company, Limited, and who found the people only too anxious to avail themselves of the opportunity to secure a telephone service that reached almost every person in the town and surrounding rural community. The organization of this system was due to the fact that many farmers had applied to the existing company for telephone service, but no serious effort was made to give them connection, and in a few cases where it was furnished the rental for the service given was almost prohibitory. As soon as it was found that the people were willing to patronize a local undertaking which would furnish local telephone service to all, at reasonable rates, the company was incorporated and commenced to build and equip its lines. A representative of the company attended the International Telephone Convention, at Chicago, saw the exhibits of the independent telephone manufacturers, and visited some of the most modern independent telephone plants in the United States. Upon his report and recommendation it was decided to build an up-to-date central energy plant. The contract for construction of the system was let to a firm of high-grade telephone contractors, with the result that the plant is all of the highest standard. To avoid placing poles on the main streets, cable is laid under ground, and the subscribers' lines distributed by means of aerial lines on poles in lanes at the rear of the buildings on the main street (Thames) and also on private property and lanes paralleling King street west. The company has about three miles of cable in the town. Having been warned by the experience of older systems, the company made what was then thought to be ample provision for all future requirements by providing a cable plant for 450 lines of metallic circuit, but already the company has found it necessary to add new cable to provide for fifty additional lines.



Switchboard—Ingersoll Telephone Company

A Splendid Pole Line—Ingersoll Telephone Company

This is probably the only company in the province which furnishes central energy service to its rural subscribers, who by simply removing the receiver, can call ''Central.'' The party lines are limited to eight subscribers on a line and the four-party selective ringing system enables four telephones to be rung on each side of the metallic circuit. Furthermore ,as positive and negative current is used for ringing, no person receives more than two rings. This system has given very satisfactory results and is much appreciated by the farmers. The annual rates in town are, business, $20.00; residence, $15.00 for individual line service, and $17.00 and $12.50 for four-party line service. Rural rates are $15.00 a year. The patronage of this system by the farmers has exceeded the most optimistic estimates of its promoters, there being at this date 450 rural subscribers within a radius of ten miles from Ingersoll. So rapid has been the growth in the country that the main leads are becoming loaded to their full capacity, the two main leads running south of the town having 54 and 50 wires respectively, the poles being 30 feet with 7-inch tops.

The company owns its central office building, nearly opposite the market square, where a four-position board of the latest central energy type is installed.

The company commenced operations on June 1st, 1907, and have every reason to be satisfied with the progress made. A development of 850 telephones in operation on one exchange in a town of 5,000 inhabitants shows that telephone competition is appreciated by the people in Ingersoll, and the surrounding district, and furnishes a very practical demonstration of the fact that the telephone business is not a natural monopoly, despite the arguments of those critics who oppose independent telephones.

That the people have benefitted by competition is shown by the fact that the town and rural subscribers were, prior to the advent of the Ingersoll Telephone Company, paying $25.00 and $30.00 a year for an inferior and limited service, while now the rates of the Bell are $25.00 and $20.00 in the town for a central energy service and $15.00 in the country for a magneto party line service.

The Ingersoll company has direct connection with the Harrietsville and Dereham companies, and through these with the South Malahide and Bayham and Belmont companies, these systems comprising 1,500 telephones. The rates are low, but with a telephone in nearly every farm house the number of subscribers per mile of pole line reduces the average cost per station. The management is, therefore, satisfied that these prices will pay all expenses, earn a reasonable dividend and provide a sinking fund sufficient to meet all future demands for renewals or depreciation. The last named item is one which the Board of Directors are determined not to overlook, well knowing that failure to make provision for the future needs of the plant means disaster at a later date.

The Board of Directors is comprised of the following gentlemen, all residents of Ingersoll and vicinity: H. F. Boyse, president; O. E. Robinson, vice-president; T. R. Mayberry, manager; E. H. Hugill, secretary; Chas. Miller and A. J. Welch.

Electricity at Toronto Exhibition

The electrical displays at the Canadian National occupied, deservedly, an increasingly prominent place. The scattered location of the various booths still leaves much to be desired, although an evident attempt was made by the Exhibition management to group the electrical exhibits. No arrangement, however, can be considered satisfactory until there is an electrical building. A brief description follows.

Northern Electric and Manufacturing Company.

The telephone equipment in this exhibit, as in previous years, demanded considerable space, and telephones of every type and design were to be seen, connected up so as to show as nearly as possible their operation under actual conditions. One of the very recent productions of this company is the mining telephone, specially designed for use in mines and places where telephones are subject to invasion from gases, acids, etc. The display of the intercommunicating telephones was especially comprehensive and sets for every purpose were to be seen in every design and capacity. A very modern and new type of switchboard especially adapted for use at small exchanges was of considerable interest to all. A feature of this board which makes it particularly expeditious to operate is that the spherical indicators which replace the older type drop usually seen, are mechanically self restored upon the insertion of the plug. The electrical supply business to which the Northern Electric are at the present time devoting considerable attention, was also well in evidence. Crouse Hinds Company, Condit Company and the Edwards Company each had a large display board carrying a range of samples. The Wire & Cable Company's display boards were also exhibited here, and fire alarm and police signal apparatus were audibly as well as visually in evidence. This company is now located in its new office and warehouse at 112 Bay street, Toronto.

Helios Arc Lamps.

This exhibit did not have a separate stand, but a number of Helios flaming arc lamps were installed around the outside of the Toronto Electric Light Company's booth. One of these was operated from 25-cycle current and close inspection of the same failed to reveal any material vibration in the light. In fact, the vibration was claimed to be less noticeable on the Helios flaming arc than on the clusters of large candle power Tungsten lamps operated from 25 cycles. There were also a number of Helios flaming arc lamps in the Midway and on the Petrie exhibit.

The Canadian Fairbanks Company.

One of the instructive exhibits in the Transportation Building was that of the Canadian Fairbanks Company, Limited, which showed a complete line of Fairbanks-Morse marine engines in sizes from 3½ h.p. upwards. These were the well-known two-cycle three-port type. They also showed a line of Fairbanks-Morse stationary engines in sizes from 1 h.p. upwards, in both the stationary and portable type. In addition to their exhibit in the Transportation Building, they had a very attractive exhibit in a tent at the east end of Machinery Hall, where they had a number of their engines in actual operation pumping water, running circular saws and grinding machines.

Death and Watson Electric Signs.

The flag on the roof of the Manufacturers' Building, erected by this company, was 15 feet in width and 30 feet in length, the total sign being 66 feet in length and 36 feet above the roof. The flag itself contained 800 lamps, the total sign containing 1,150 lamps. The flasher was especially designed for flag waving so as to give the perfect waving effect, namely, the long wave at the staff and a short ripple at the outer end of the flag. For the Toronto Electric Light Company the same firm erected the 13 x 20 panel spoken of elsewhere. This contained in the neighborhood of 650 lamps. In the centre of the panel a flat-iron in natural colors burned steadily. This iron was surmounted by a ruby ellipse of moving lamps. In each of the bottom corners of the panel a green scroll waved and out of the scroll arose two rockets, crossing at the top and bursting into various colors. The wording "Electricity Makes The Sad Iron A Glad Iron," then appeared, the rockets disappearing. The whole cycle then repeats. For John Taylor & Company, soap manufacturers, two signs which were placed around the top of their booth in the Manufacturers' Building, were supplied by this firm, as were also for the Gutta Percha & Rubber Company, a temporary sign reading "Fisk Tires" and having in the centre a revolving automobile wheel, and for the Standard Silver Company, a transparency representing their trade mark.

H. W. Johns-Manville Company.

The display of the Canadian H. W. Johns-Manville Company, Limited, 85-87 Wellington street west, was one of the most attractive in Machinery Hall. Full and complete lines of "Noark" fuse, service and subway boxes, as well as general fuse accessories, were shown; also their line of J-M indurated fibre conduit, electric railway material, friction tape, splicing compound and moulded mica sockets. Their booth was brilliantly illuminated by their well-known system of "Linolite."

Factory Products, Limited.

This electrical firm displayed a varied list of quartzite tubes, radiators, heating and cooking appliances, Osram fixtures and lamps up to 200 c.p., carbon lamps of various sizes and types, prismatic shades, etc. A special feature was their combination toaster, broiler and hot plate for cooking. This firm had also on exhibit a new instrument in the form of a "cost meter," which registered, directly, the cost for 100 hours, of current being consumed by any small appliance such as lamp, stove, toaster, etc., to which it may be attached.

The very handsome cast iron fixture on display in this booth was manufactured by the Canada Foundry Company and is to be used, with a half dozen more just like it, in illuminating the Winnipeg railway depot.

Canadian Westinghouse.

This well-known firm exhibited a number of small motors which were chiefly in use, however, in demonstrating the various household uses for which they are in constant demand, such as sewing machines, electric fans, washing machines, dental and polishing work, etc. In addition to these there was also demonstarted a varied line of toaster stoves, flat irons, luminous radiators, disc stoves, glue pots, sad irons, chocolate warmers, etc. The sad irons, especially, were the cause of much inquiry; the element in this iron is of German steel, covers the whole surface of the iron and consumes as little current, about 300 watts, as is consistent with a proper heating of such an iron for continuous work.

Canadian Knowles Company.

Among the many exhibits one worthy of note was that of the Canadian Knowles Company, Limited, in the Transportation Building, in charge of their Mr. F. C. Carman. These people had a splendid display of "Klaxon" Warning Signals, for which they are sole distributors for Canada. They also had on exhibit "Volta" high-tension magnetos and spark plugs, puritan ignition switches, Tate storage batteries and the Couch modelfone for connecting house and garage. Owing to the scarcity of space, they were unable to show their full line of electrical goods, but from the numerous enquiries received, good results are expected for their fast growing business.

The Sterling Electric Supply Company.

The articles displayed included the following,—"Pacific Hot Point Irons" and heating apparatus. The utility set showing how it is possible for the travelling man to carry an iron around with him, or which his wife can use at the house. When not in use the iron can be turned up side down on a stand and with the receptacle which goes along with the outfit, one can heat a quart of water in ten minutes, and at the same time heat a pair of curling tongs. The toaster "El Tosto," which is made away out in California, in what is claimed to be the largest electric iron factory in the world. The best evidence of how the firm stand by this product is the fact of the guarantee for two years. Detroit Fuses; This is the fuse with the mechanical indicator, the only one of its kind. It shows how the switchboard attendant or electrician can tell at a glance which fuse is blown.

The Radiant Electric Iron.

To-day the woman who irons with a Radiant Electric Iron completes her task in one-quarter of the time. She has no fuel or ashes to contend with; irons in the laundry, the living room or the back porch, as she chooses, having absolute control of the temperature of the iron at all time; using it either hot or medium. The Radiant electric sad iron is proving highly satisfactory, not only in economy of operation, but in efficiency and durability. They are fitted with the latest ideas of some of the best electrical heating engineers, and combine quality and excellence in style with efficiency, not only from a theoretical, but from a practical standpoint. The faith of the manufacturer in the stability of the heating element is shown by their guarantee to renew all heating elements free of charge if burned out within one year.

The Canadian Independent Telephone Company.

This company showed finished telephones of the most modern type, including desk and wall sets; large and small switchboards for all sorts of service, including four and eight party selective boards. In addition were shown all the stages of construction of the telephone from the raw material to the finished product. The office of this company is at 18-20 Duncan street, Toronto, where they manufacture nothing but telephone equipment, included in which is the Lorimer automatic type telephone, which is being successfully tried out in a number of Canadian towns.

The Westinghouse Nernst Lamp.

The Westinghouse Nernst Lamp Company exhibited jointly with the Canadian Westinghouse Company. This lamp was shown in different sizes and units. The efficiency of the lamp is claimed to be 1.2 watts per m. h. c. p., as high as that of any other high efficiency lamp on the market. The renewal consists of a burner or holder which, in the latest type, is screwed into a socket in the same manner as an incandescent lamp, thereby doing away with all labor involved in mounting glowers and heater tubes, as was the case with the old Nernst lamp. A very artistic and original line of fixtures equipped with Westinghouse Nernst lamps was shown and also a full line of inexpensive fixtures and clusters. The high efficiency of this type of lamp, together with the low renewal cost should appeal to all users of artificial light. It is claimed by the manufacturers that this is the only electric light at the Exhibition operating on 25 cycles that did not show any flicker.

The Toronto Electric Light Company.

This company maintained a booth 13 x 43 feet, which was conceded by all visitors to be one of the most brilliant and beautiful booths on the grounds. The ceiling was studded with 60-watt Tungsten lamps with Holophane reflectors. On the roof of the booth there was a handsome sign, 20 feet by 14 feet, of an electric flat iron superseded by two rockets that broke into stars, flashing alternately with the words, in 14-inch letters, "Electricity makes the Sad Iron the Glad Iron." On exhibition in the booth were Spencer turbine cleaners, operated by 5 and 2 h.p. motors respectively, electrically operated cash registers, adding machines, washing machines, portable vacuum cleaners, electric flat irons, toasters, water heaters, waffle irons, percolators, heating pads, luminous radiators, electric signs, and numerous other devices typifying the convenience and flexibility of electricity as a lighting, heating and driving agent.

Stromberg-Carlson Telephone Manufacturing Company.

This company showed a central energy lamp line signal switchboard of the desk type having an ultimate capacity of 60 lines, designed for private branch exchange work, and, a generator call switchboard fitted with their new type No. 8 self-restoring gravity drops, a special feature of which is the ease with which the exciting coil is removed, thus facilitating repairs or changes. One of the special telephones shown was their No. 896 compact type bridging telephone for rural lines; the sales on this particular type of telephone have been very large. Its main feature is accessibility, the ringer, condenser and induction coil being mounted on the door. The generator is also mounted on a removable generator shelf which makes it easy for examination. There were also exhibited their standard service of flush type, intercommunicating telephones for factory, residences, etc.; also their dust and water, case-proof, iron clad mine telephones; also railway telephones for dispatching purposes and magneto test sets, together with a large assortment of miscellaneous apparatus.

The British Aluminium Company.

One of the most interesting and instructing exhibits at the Exhibition this year was that of Messrs. Parke & Leith, general agents in Canada for the British Aluminium Company, Limited. This company, which is the largest producer of aluminium in the British Empire, has extensive works at Kinlochleven and the Falls of Foyers, Inverness, Scotland; Stangfird, Norway; and Orsieres, Switzerland. The metal is produced from a species of clay termed "Bauxite." The exhibit included aluminium ingots, sheets, tubing, rods, angles, tees, wires, cables, etc., and was calculated especially to demonstrate the rapidly increasing and wonderfully varied uses to which this metal is now applied.

The Collier Electric Company.

This company displayed a very complete line of electric household conveniences, including radiators, disc stoves, toasters, photo mounters, flexible heating pad, and various sizes of flat irons. Great stress is laid upon the automatic cut-out switch on these irons; by simply setting the iron down on its heel the current is automatically shut off. This would appear to be an important device inasmuch as the very smallest delays in the work are saved in the consumption of current without the least effort or thought on the part of the operator.

Jones and Moore Electric Company.

The Jones & Moore Electric Company had an attractive and roomy looking display of alternating and direct current motors and dynamos in various sizes up to 100 h.p. The two 50 h.p. motors operating the Machinery Hall, as well as all motors running the shafting in the Process Building, were also manufactured by them. They also showed a line of "Century" single phase motors, and were demonstrating a new type of electric iron, the Pelonize, which was quaranteed to consume less current than any other make. A feature of this iron also is its simple method of current control. This firm have displayed their goods at Toronto Exhibition for the past twenty years, and each year bring forward some improvement in their machines, which are enjoying a splendid reputation all over Canada.

The Northern Aluminum Company, Limited.

The Northern Aluminum Company, of Shawinigan Falls, Que., exhibited in the Process Building a complete line of their manufactures. Besides a fine display of cooking utensils, there were samples of various gauges of sheet, castings, tubing, extruded forms for automobile bodies and carriages, and pyramid sheet for steps and floors of automobiles. The part of the display that interested engineers most was, probably, the samples of aluminum wire and cable for power transmission lines, such as used by the Hydro-Eleteric Power Commission. Various kinds of joints for splicing showed that the problem of uniting the cable has been very satisfactorily solved.

The Steel Company of Canada.

This is a new company with offices in Montreal and Hamilton. A short time ago it absorbed the Dominion Wire Manufacturing Company and its exhibit included all kinds of wire, iron, steel. brass and copper. This company manufacturers wire for all telephone, telegraph, trolley and transmission purposes.

Electrical Specialties.

This firm exhibited a fine display of all automobile and motor boat sundries including cells, spark coils, magnetos, etc.

Keith and Fitzsimmons.

Hammered brass fixtures were a prominent feature, this firm showing a number of varied and very beautiful designs. A number of cluster drop lights for dining room purposes were also a feature, as well as their display of brass work for church decorations.

James Morrison Brass Works.

The latest novelties in brass decorations were shown including shower fixtures, domes, newel fixtures. A specially attractive design consisted of a shower fixture in hammered brass with French gold finish.

McDonald and Willson.

The electric fixtures shown by this firm were among the most beautiful and also combined utility with grace. The exhibit was exceedingly varied and calculated to satisfy all tastes whether elaborate or simple.

The H. W. Petrie, Limited.

The exhibit was very complete and showed a gas producer in operation, supplying gas to a producer gas engine, which, in turn, operated a 75 h.p. electric generator. The claim of Mr. Haggas, who had the exhibit in charge, is that the cost of power generated by this means is three-quarters of a cent per horsepower per hour.

Dominion Telephone Manufacturing Company.

This Waterford firm manufactures and had on exhibit telephones, switchboards and all kinds of telephone supplies. The particular type of switchboard shown is similar to a number being manufactured at present to fill an order from the Manitoba government. This firm makes a specialty of complete equipment for rural systems.

Sundry Other Displays.

In addition to the above, the Standard Glass Company had an artistic display of electric fixtures and colored glass windows. Jones & Glassco were demonstrating their Reynold's noiseless gear chain, which is meeting with such general favor. The Canadian Producer & Gas Company, of Barrie, had a fine display of producer gas engines, shown in action operating a large electric generator, and the A. D. Fisher Company had an extensive exhibit of small motors.

The city of Winnipeg has accepted the tender of the Canadian British Insulated Company for the whole of the high tension power cables to be required in connection with their municipal hydro-electric development at Point du Bois. The same company has also received the order from the city of Ottawa for all their requirements. These cables have to be supplied and installed under a five years' guarantee.

The engineering firm of Chapman & Walker announce that they have been awarded recent contracts in Victoria, Medicine Hat and Calgary. In Victoria it is a 100 h.p. gas engine and producer plant for the Victoria Chemical Company. The producer in this case will utilize sawdust for fuel. In Medicine Hat they will supply two 200 h.p. vertical high speed 4-cylinder Crossley gas engines for use in the city electric light plant. In Calgary, for street railway purposes, the order is for a 600 k.w. 550-volt d.c. interpole Dick Kerr railway generator. This latter will be driven by a Robb engine.

Owing to increasing business in the West this firm has opened branches in Winnipeg, Calgary and Vancouver.

New Branches Opened

The Engineering Equipment & Supply Company, of Montreal, with a view to facilitating their business relations with the Ontario and Western Canada districts, recently opened branch offices at Toronto and Winnipeg.

For the Ontario district, Mr. C. C. Bothwell, until recently associate editor of the Canadian Electrical News, has been appointed representative and is located at Rooms 1 and 2, Crowther Building. 166 Bay street, Toronto.

The Western interests of the firm will be looked after by by Mr. J. A. McEachren, who has opened an office at 199 Portage avenue, Winnipeg.

The Engineering Equipment & Supply Company, besides handling their well-known Excello specialties, including flame lamps, carbons and economizers, are the Canadian representatives for the Locke Insulator Manufacturing Company, of Victor, N.Y.; Hartman Circuit Breaker Company, Mansfield, Ohio; Dominion Electric Company, St. Catharines; Eastern agents for the Weston Instrument Company, of Newark, N.J., and also representing some of the larger European manufacturers of electrical lines.

Nearly 100,000 passengers were carried by the British Columbia Electric Railway on Labor Day—an increase of practically 33 per cent. over last Labor Day, when 74,150 were carried.

Trade Publications

Electric Heat in the Manufacture of Hats.—Circular No. 1175, issued by the Westinghouse Electric & Manufacturing Company, Pittsburg, containing an illustrated description of the various stages in the manufacture of different kinds of hats with electrical machinery.

Reynold Driving Chains and Their Use.—Catalogue issued in both English and French by Jones & Glassco, Montreal, Canadian agents for the Hans Renold, Limited. The catalogue is fully illustrated and explains the advantages these chains offer compared with the older methods of power transmission. The same firm has also just issued a little booklet dealing with woodworking machinery.

The Brush Electric Lighting Set.—A very interesting booklet issued by the Chas. A. Strelinger Company, Detroit, in explanation of their individual lighting sets, consisting of a gasoline engine direct connected to a small dynamo with a capacity of 4 to 5 kilowatts. The publication is, in a sense, an elementary treatise on electric lighting and contains much information that will instruct the average electric customer.

The Victoria Safety Turbo Pump.—Catalogue issued by the Canadian Boving Company, Toronto, descriptive of pumps manufactured at Rugby, England, by the Jens Orten Boving & Company, and for which are claimed the following advantages—constant amount of water for all heads—overloading of motors impossible. The same company also is issuing a catalogue descriptive of the Pearn pump, manufactured by Frank Pearn & Company, of Manchester, Eng.

National Air Compressors.—Publication No. 391, issued by the National Brake & Electric Company, Milwaukee, U.S.A.—a 70-page description of various types of compressors and all accessories—well illustrated—with line cuts showing internal structure.

Direct Harmonic System for Magneto Exchanges.—The Kellogg Switchboard & Supply Company have just issued a folder describing the Kellogg direct harmonic system for magneto exchanges. Some of the advantages of the system are: Four telephones can be operated selectively on a metallic circuit with no grounds at subscriber's station or at central office; four telephones can be operated selectively on a one-wire grounded line; eight telephones can be operated selectively on a full metallic circuit by bridging four bells from each side of line to ground; subscriber calls central and "rings off" without disturbing any bells on the line. Neither can any bell on the selective line be disturbed by a ring coming from any connected line. The same company have also issued new folders on their various types of Lineman's Test Sets and the Kellogg Malleable Iron Pole Telephone.

Blake Insulated Staples.—Booklet distributed by the Canadian General Electric Company. The same firm has also just issued "Condulet Talk," No. 122; "A Revolution in Lighting," treating of Madza lamps and "letter" No. 169, dealing with the G. E. miniature swivel attaching plug.

Telephone and Electric Bells—Catalogue No. 167 (Canadian Edition), issued by the Sterling Telephone & Electric Company, Limited, London, England, descriptive of their various lines, including telephones, bells, annunciators, fire alarms, pushes, batteries, wires, etc.

Power Control.—Volume 1, No. 1, of a small magazine to be published quarterly "in the interests of all users of water power" by the Woodward Governor Company, of Rockford, Illinois.

Consul W. Maxwell Greene, of Hamilton, Bermuda, writes that an electric railway system to connect all parts of Bermuda is projected by a Canadian company which is now seeking a charter. The cost of the system is estimated at $1,000,000, the length of the road to be 30 miles.

Current Notes

Wolfram exists in considerable quantities in Australia, and many large deposits are known, but not worked owing to the paucity of markets, due probably to the fact that there are only one or two organized buyers. The exports of wolfram from Australia in 1908, the latest statistics available, amounted to 14,080 hundredweight, valued at $273,287, of which the United Kingdom took $169,763 worth, Straits Settlements $1,874, Belgium $3,893, France $457, and Germany $97,300.

The P. H. Klein, Jr., Co., sole agents in Canada for the "Bergmann-Tungsten" lamps, state that since the opening of their Montreal office on July 1st last, the rapid increase in their business, which had heretofore been restricted by reason of having no Canadian office, has amply demonstrated the wisdom of the move. The Montreal office is in charge of the secretary of the company, Mr. Edward Klein, E.E., while the sales department is being successfully operated under the management of Mr. A. Genstein.

The D. P. Battery Company, Limited, of Bakewell, state that they have just concluded contracts for the supply of their batteries, to the district councils of St. Annes-on-Sea, and of Naas, (Kildare), the Chorlton Board of Guardians and for a number of private installations. The maintenance of these batteries for terms of years has been undertaken by the company. They have also secured orders for three batteries for South Africa for mining and other purposes. The company wish to appoint additional agencies in foreign countries where they are not already represented.

The Association of Electrical Engineers, Belgium, graduates from the Montefiore Electro-Technical Institute, has recently issued a prospectus of the conditions governing competition for a prize to be awarded during 1911. This prize, consisting of the accumulated interest on 150,000 francs ($28,950), in Belgian 3 per cent. bonds, is to be awarded to the author of the best original work presented on the scientific advancement, and on the progress of electricity in its technical applications. Articles may be written either in French or English, and printed or in typewritten manuscript. The jury will be ten electrical engineers, five Belgians and five of other nationality, under the presidency of the director of the Montefiore Institute. Twelve copies of each contribution must be sent postpaid to M. le Secrétaire-Archiviste de la Fondation Georges Montefiore, Rue St. Gilles, 31, Liege, Belgium, before March 31st, 1911.

Mr. John Millard, of Sydney, manager in the Pacific for the Pacific Cable Company, stated in Vancouver recently that he is sanguine that the project of a state-owned cable from Eastern Canada to England will be realized. As the Pacific Cable Company is controlled by the British Government this would mean an imperial link from Austrialia, via Canada, to England—half way round the world.

The convention of the Canadian Independent Telephone Companies of Canada will be held in Toronto on the 17th of November this year. Previous conventions have been held during Exhibition, but it was felt by the management that the counter attractions were not in the best interests of telephone matters, hence the change in date.

Mr. W. F. Simmons, who for the past two years has been superintendent of the Toronto Suburban Railway and sales manager for George C. Royce, Canadian representative of Ferranti, Limited, has tendered his resignation to join the Canadian Fairbanks Company. He will have the management of the electrical department of the Toronto office, in charge of the territory from Belleville west to Windsor and north to Sudbury, and assumes his new duties October 1st.

Current News and Notes

Brantford, Ont.

The Canadian Machine Telephone Company, Brantford, has made an important extension. It has secured connection with the Burgessville Telephone Company, which has 600 subscribers.

The Brantford city council has passed a by-law granting concessions to the street railway in order to secure the immediate construction of a switch to the Penman Company, which will at once begin the construction of an $80,000 extension to their works to employ 400 hands. The special line will be needed to convey employees to the factory.

Berlin, Ont.

A deputation from this city waited on Hon. Adam Beck to lay before him the claims of Berlin as the proper place to celebrate the completion of the Niagara power lines. It is understood the request was favorably considered and that the celebration will take place about the middle of October.

Brandon, Man.

Professor Herdt, of Montreal, has been called upon by the city council to give an expert opinion on the various schemes of electric power development which are offering contracts to the city.

Burnaby, B.C.

The site is being cleared for the $80,000 power sub-station to be erected on the G. N. R. line.

Barrie, Ont.

The Bell Telephone Company have commenced the work of placing nearly all of their wires, in the business section, underground.

Brockville, Ont.

Tenders are being called for debentures to be issued for the light and power department.

Cochrane, Ont.

This town wants a water power on the Obilitske, eight miles away, developed, and has suggested that the Hydro-Electric Commission take the matter in hand.

Calgary, Alta.

The by-law to expend $484,000 on extensions to the municipal street railway system during the next year, carried on September 15th by an overwhelming majority.

East Angus, Ont.

The Westbury Electric Light & Power System are installing another 125 horse power Crocker turbine, manufactured by the Jenckes Machine Company, Limited, of Sherbrooke.

Edmonton, Alta.

During the month of August, the report of the Electric Light Department states, there was an issue of 54 electric irons.

Reports to the Department of Public Works, Ottawa, with reference to the projected waterway from Winnipeg here, are to the effect that 80,000 h.p. can be harnessed at Grand Rapids, where the junction with Lake Winnipeg is effected. It is stated that this power is capable of development without difficulty and that in addition to stimulating local industry, it would be quite easy to transmit the electric energy to Winnipeg. Preliminary reports on the scheme from the eleven parties now in the field, are expected for the next session of Parliament.

Engineer Fielding, who has been appointed by the city to investigate the Athabasca river power proposition will renew his conference with City Engineer Latornel shortly. Mr. Fielding will likely start about the 20th of the month for the scene of operations and will take with him a party of about three. It is thought that it will be possible to harness several of the falls on the Athabasca river, including Grand Rapids, Pelican Rapids, Stony Rapids and the Rap du Joli Falls. Grand Rapids is about 25 miles north of the Rap du Joli Falls, while the others are about six miles apart.

The city council has been approached by Robert H. Palmer, who states that he has knowledge of an 80-foot waterfall in the neighborhood which would suit the city's needs for power. Commissioner Bouillon was instructed to inquire into the matter further.

On the advice of the commissioners the single end control type of electric cars will in the future be used by the city, and the cars that are now under course of construction by the Ottawa Car Company will be changed from the double end system to the single. According to the report of the commissioners on the subject the company was agreeable to making the change, but stipulated that $24 per car extra would have to be paid to cover the cost of so doing. This will involve constructing wyes or loups at the ends of all lines, but this extra cost will be more than counterbalanced by a saving in cost of the electrical equipment.

The city commissioners have decided not to award the contract for the reconstruction of the power house, and the work will be done under the supervision of the commissioners themselves.

Fort Frances, Ont.

Premier Laurier on his recent visit to this town, stated that the agreement with the Ontario & Minnesota Power Company, which expires in March next, would not be renewed without giving the town a chance to be heard. He further promised to take up the matter of a regular toll tariff for the Canadian consumer.

Fort Saskatchewan, Alta.

Tenders are being considered for machinery and electrical equipment for hydro-electric plant at River Sturgeon. Construction on the dam has commenced. Thos. J. Stacey, secretary-treasurer.

The contract has been let by this municipality to the Evans Construction Company, Edmonton, for the construction of a dam on Sturgeon river at a cost of $20,000. Lighting and power for other purposes will be supplied.

Guelph, Ont.

On September 26th a by-law will be voted on to issue $85,000 4½ per cent. 30-year street railway debentures. T. J. Moore, city clerk.

At a public meeting held here to discuss the people's railway by-law, Hon. A. Beck made the statement that as a result of the saving on equipment the price charged for power in Guelph will be $21.79 per horse power, instead of $24. The equipment of the system was obtained $307,000 under the estimate.

Galt, Ont.

The water commissioners of the town of Galt are considering the use of Niagara power for the operation of their pumps in the water works. They had a recent conference with Engineer Yates, of the Hydro-Electric Commission to discuss this question.

The Fire and Light Committee of the town council have had plans prepared for the lighting of the town with Niagara power. The plans call for 400 lights.

Huntingdon, Que.

At a meeting of federal and provincial members of parliament and wardens of the counties of Chateauguay, Huntingdon and Beauharnois in the Court House at Huntingdon, the needs and possibilities of electric railways were discussed. It was resolved that in considering the plans for the enlargement of the C. P. R. bridge, provision should be made for electric tramway.

Hamilton, Ont.

In the action brought by the Mercantile Trust Company, acting as administrator for the estate of Nicolai Hanen, a workman who met death while in the employ of the Niagara Construction Company, against the latter company, the estate was awarded $875.

As a result of friendly conferences it is believed the city and the Cataract Power Company have about come to an agreement with reference to the several matters in dispute. It is proposed to cancel, by mutual consent, the power contract of 1908, and a compromise has been effected with reference to the repairs of pavements adjoining the company's street railway tracks. No agreement has yet been reached with reference to the old street lighting contract.

Kamloops, B.C.

The copper production of the British Columbia Copper Company for July was 574,172 pounds. This compares with 417,040 pounds in June.

London, Ont.

Trouble still continues between the city and the London Electric Company over the height of the transmission poles of the latter company.

Reports from Port Burwell and intervening points, indicate that the Port Burwell, Aylmer and London Railway will be built early next year. Mr. J. H. Teall is attending to the financial arrangements, which are reported to be progressing favorably.

Montreal, Que.

The Provincial Power Company, which submitted the lowest tender for Montreal's street lighting, owns and operates the plant at Soulanges, which generates power from the Cedar Rapids. This plant has now been in operation during a period of two years. Fifteen thousand horse power is developed at present, which, it is said, can be increased to twenty thousand when necessary.

The financial side of Montreal's chief electrical concerns have attracted much attention, owing to talk of a merger between the four larger companies, Montreal Street Railway, Canadian Light & Power, Montreal Light, Heat & Power, and Shawinigan Water & Power. There is a clause in the Canadian Light & Power Company's charter prohibiting that company from amalgamation with any other similar enterprise, but in spite of this the rumor of a merger is very persistent.

Work has just been commenced by the Montreal Street Railway Company on the neighborhood of a million and a half dollars and will give employment to a small army of mechanics and workmen. The shops are to be used for the construction and repair of street cars.

A ten million dollar company has been incorporated here under the name "The Montreal Hydro-Electric Company."

The Board of Control recently discussed the resolution of the city council asking it to consider the advisability of installing a new style of fender on the street cars and also of placing side fenders on the cars. The general opinion of the Board was that side fenders were of little value and that a strict enforcement of speed regulations with careful attention to the condition of the brakes is the best means of safeguarding the public.

In order to remove the unsightly and dangerous overhead electric wires the city has decided to construct underground conduit systems to be used by the various electrical companies, from whom the city shall collect an annual rental. About twenty-six different companies are affected by the decision.

The suggestion has been made by Mayor Geoffrion, of Longueuil, that by means of a bridge between the city and St. Helen's Island the latter place be given street railway service.

Medicine Hat, Alta.

The Alberta Southeastern Telephone Company, operating lines from Medicine Hat to Cypress Hills, is said to have received an offer from the Provincial Government for the purchase of the line, which will probably be accepted.

Matheson, Ont.

McDougall's Chutes may be deevloped to give power and light to this town.

Merritt, B.C.

It is the intention of the Merritt Water, Light & Power Company to have an electric light plant with a 1,000-light capacity in operation before Christmas. Arrangements are already in progress for securing the plant. Two large capacity gasoline engines are to be installed for the present to operate the dynamo.

New Westminster, B.C.

The Canadian British Insulated Company of Montreal, Lawford Grant, managing director, have received a contract for 40 miles of street railway equipment from the B. C. E. R.

A gang of men has commenced work in Burnaby for the Stave Lake Power Company, clearing the site for the large $80,000 power sub-station to be erected there on the Great Northern line. Construction work on the building will be commenced shortly. The company hopes to be in a position this winter to supply light and power for the towns of Port Haney and Port Hammond and other places in the municipality of Maple Ridge. The work of constructing the pole line from the company's plant as far as Pitt river is in progress. The wires will not be strung until the company is ready to distribute power. These poles will at first carry 12,000 volts for local distribtuion.

Orillia, Ont.

At a recent meeting of the council it was decided to spend immediately $10,000 in improving the power plant. A by-law will be submitted to the ratepayers asking them to authorize the expenditure. The installation of a new unit and greater wheel capacity must, however, follow within a year or two, and this will entail a probable expenditure of from $25,000 to $30,000.

Ottawa, Ont.

J. B. McRae has been chosen engineer for constructing new dams at the foot of Gull lake and Long lake on the Mississippi river, Ontario. These dams of concrete will replace the present wooden structures. The power owners at Carleton Place, Almonte, and other points along the river are uniting in the work.

A new contract has been made by the Hydro-Electric Power Commission for the delivery of 1,500 addition horsepower to be used in Ottawa and Hull, the price to be $15 per horsepower. Some months ago the Power Commission contracted to deliver 1,500 horsepower to Ottawa, and this was used for municipal purposes, such as lighting, etc. Later the order was increased by 1,000 horsepower. The present order will bring the total delivery up to 4,000 horsepower.

The civic commission has awarded the following contracts for the new conduit from the power station in Hull to the distributing station on Laurier avenue: For transformers, Canadian General Electric Company, $12,000; cable, British Insulated Cable Company, Montreal, $16,246; conduit pipe, Eadie-Douglas Company, Limited, $2,704; manhole covers, J. B. Maclaren, Ottawa, 2¼ cents per pound for cast iron, and $35 per ton for rails.

Mr. Alvan Woolf, representative of the Canadian Tungsten Lamp Company, who was here on his way through to "the wild and woolly West," amongst his other novelties, was showing a very ingenious arc for store lighting, which, by a clever contrivance, is stepped down to 25 volts. The lamp used is a Kolloid Wolfram Tungsten from 200 to 400 c.p., and is so robust that without breaking the bulb, it is practically impossible to fracture the filament.

The Ottawa Electric Company is trying to arrange terms with the city to lay an underground power conduit from the Chaudiere to a sub-station on Slater street, between Metcalfe and Elgin streets, similar to that which the municipal electric plant is now constructing.

The Canada Gazette announces the appointment of Harold Clarke, of Toronto, to be assistant inspector of gas and electricity in the gas and electricity office at Toronto.

The Department of Labor has received a request on behalf of the linemen on the B. C. E. Ry. Company, asking for the appointment of a board of investigation into differences with their company. It is also said that the governor of the State of Ohio, learning of the success of the Canadian Act in the Toronto Street Railway case, has asked the department for copies of the Act, and that he may call a special session of the legislature in order to secure the passage of a similar act by his state.

Ottawa proposes to do away with all the poles which disfigure its streets and replace them with conduits. Negotiations between the city, telegraph, telephone and lighting companies are now in progress.

Mayor Hopewell has figured that the annual saving to the merchants in insurance rates, which he places at $15,000, would be ample to pay for the cost of placing all the wires on the main portion of Sparks street underground. It is probable an attempt will be made to arrange with these property owners to bear the cost of the underground construction in view of the ultimate reduction in insurance rates.

To a Canadian, J. D. A. McCurdy, belongs the honor of being the first to transmit a wireless telegraph message to the earth during a flight. This was accomplished at Sheepshead Bay race track, New York, recently.

The protest of the Montreal Cotton Company against the works of the Canadian Power Company along the Beauharnois canal at Valleyfield has resulted in operations being stopped by an order from the Department of Public Works. It is situated between St. Francis wharf and MacPherson's Point in the town of Valleyfield, and the contention of the Cotton Company is that by the proposed crib work and filling, the flow of water in the channel leading to the mills will be obstructed and these industries injuriously affected. Apart from the objections of the Cotton Company, the safety of navigation on the St. Lawrence has also to be considered.

Extensions to the Hull Electric line along the Chelsea road were sufficiently completed for the cars to commence running early in September.

The commisison on conservation has received notice that the city of Winnipeg has filed a protest with the International Waterways Commission regarding an alleged cutting off of over 4 per cent. of its water power through a license issued to the Minnesota Power & Canal Company.

Peterboro, Ont.

The Canadian Machine Telephone Company are asking an extension of their franchise in Peterboro for twenty-one years. The company promises to spend $10,000 in extensions and to give free connections with all rural telephones within a radius of 10 miles.

Port Arthur, Ont.

The by-laws to build car barns and to buy land for power plant were carried.

The line by which Port Arthur will get Kekabeka Falls power is now completed and the town is on the 24-hour service. The line was constructed by the Carter-Jones Electric Company, of this city.

The gross earnings of the Port Arthur and Fort William Street Railway for the year ending August 30th, were $130,664; total operating expenses, $74,373; net earnings, $56,290; number of fare passengers carried, 2,832,426.

Petrolea, Ont.

The town council have had difficulty in closing an agreement, for lighting, with the Petrolea Utilities Company and are considering estimates on the cost of a municipal lighting plant.

Portage la Prairie, Man.

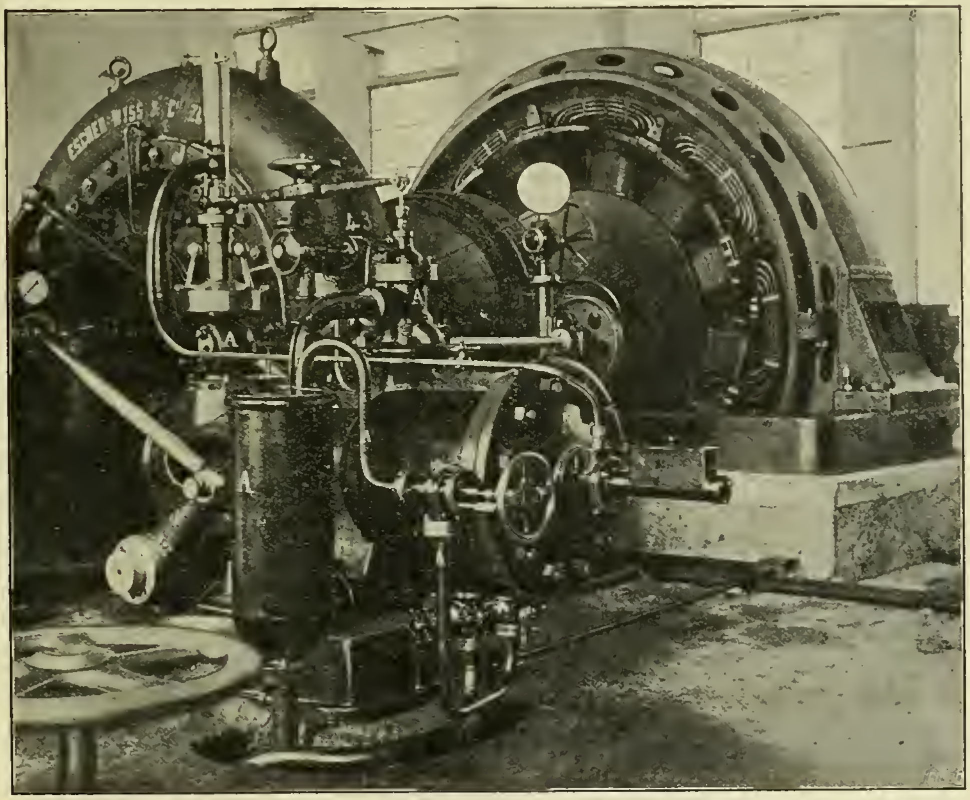
Mr. R. C. Brown, at present local manager of the Manitoba government telephones at Dauphin, has been appointed local district manager, and will make his headquarters in Portage la Prairie.

Port Credit, Ont.

The Hydro-Electric Commission awarded the contract for the erection of a distributing station and the necessary electrical apparatus at Port Credit at a total cost of about $90,000.

The Hydro Electric Power Commisison of Ontario have awarded to Allis-Chalmers-Bullock, Limited, Montreal, the contract

SIEMENS



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for the electrical equipment of the sub-station at Port Credit, including four transformers, 1,250 k.v.a., 25-cycle, single-phase, 63,500 to 13,200 volts, for operation on their 110,000-volt high tension transmisison lines.

Prince Rupert, B.C.

It is stated that new equipment for the new municipal telephone system will be required.

Quebec, Que.

The net earnings of the Quebec Railway, Light & Power Company for July are stated to have been equal to 4¼ per cent. on the common stock. There seems to be good prospects of a small dividend in the not far distant future.

Rouleau, Sask.

Tenders will be received until October 1st for construction of the Adelaide telephone line from Rouleau in a northwesterly direction. Tenders will also be received for supply of material. Plans, etc., at Department of Telephones, Regina. F. R. Fitzpatrick, secretary-treasurer.

Regina, Sask.

Extensions to the light and power plant are considered. City Electrician Bull has made a report. It is possible much new equipment will be needed.

A tender for steel switches for the new street railway was received from United States Steel Product Company and the contract awarded to them.

Ruskin, B.C.

Mr. C. H. Cahan recently announced that on the completion of the present 50,000 h.p. development at Stave Lake, a second installation lower down the Stave river, capable of developing a similar amount of power, would probably be started.

Strathcona, Alta.

Telegraphic communication has been completed by the Dominion Government between this city and a point about 400 miles north, known as Peace River Crossing. It is planned next year to extend still farther northward to Grand Prairie and Fort Vermilion.

The commission consulted recently on the subject of orders for synchronous motor, tungsten lamps, meters, etc., but were not quite perpared to order yet. The former will likely be of 150 h.p., and will be adaptable either as a motor or a generator.

Sherbrooke, Que.

Mr. Justice Tellier, in the Superior Court here, dismissed the injunction petition against the Sherbrooke Power & Railway Company, which had been instituted by Mr. T. M. Craig. The petitioner asked that the company be stopped from going on his property at the carpet works, where the company had started the erection of a dam.

Mr. A. T. Nourse, a well-known citizen of Sherbrooke, and for many years local representative of the Great North Western Telegraph Company, died recently at his home in this city.

Great progress is being made on the dam and power house of the Sherbrooke Street Railway & Power Company. Construction work on the power house will commence shortly. The new dam will be 300 feet long and is built across the rock gorge. The water thus stored up will be carried by a large steel penstock to the new power house 650 feet below, which will give a working head of 65 feet. The plans of the company will result in Sherbrooke having a modern traction system. The entire system will be relaid with heavier rails, and new lines will be built which will double the mileage of the present system. Among the new lines proposed is one for the east side of the river running to the Quebec Central shops at Newington. The company expect to have the power plant in operation by the end of October.

St. Thomas, Ont.

The tender of the Canadian General Electric Company for supplying new transformers and purchasing 132 old ones for the local hydro-electric distributing plant was acepted, it being the most favorable of three others. The amount involved is about $15,000.

The booster for the hydro-electric transformer, which arrived in the city from England, was found to be damaged, having a bad break in the bed plate and shafting. The damage will cause a delay of three weeks before the Niagara power can be installed in St. Thomas.

The Bell Telephone Company have located serious electrolysis damage to their underground cables, owing to the imperfect bonding of the street railway rails. To overcome this trouble the Bell Telephone Company, at their own expense, are erecting a return bond wire from their underground cables to the return bus-bars of the street railway generators.

Seaforth, Ont.

The Seaforth town council is considering the advisability of establishing a municipal telephone system for Seaforth, on the same basis as similar systems have been installed in the neighboring townships.

St. John, N.B.

The lights for the illumination of the city during the Dominion Exhibition, installed by the street railway company, have excited the admiration of the thousands of strangers in the city as well as of our own people. Many express regret that the additional lighting could not be made a permanent feature, at least during the winter months. It is contended that this would result in greatly augmented business for the merchants.

Stewart, B.C.

According to an authoritative statement by an officer of the Portland Canal Light, Water & Power Company, which is now supplying the Stewart district with electricity, that concern has abandoned the proposed power house site on the Marmot river and will build on the American creek, where, it is stated, more power will be obtainable. An agreement has been made with the Stewart Land Company whereby the change of sites is made possible and the intention of the power company is to raise at once an additional $100,000 and install a large Pelton wheel plant from which power can be distributed throughout the whole district. At present the company is operating a temporary plant.

Toronto, Ont.

Mrs. Delaney sued the Toronto Railway Company in County Court before Justice Morgan and a jury for unstated damages and was awarded $250. Plaintiff was struck by a Dupont car at the corner of King and Yonge streets on March 6th and sustained a sprained ankle and general shaking up, from which she has not yet fully recovered.

Surveyors and engineers have about completed their work of locating the best available route for part of the electric railway for the district east of Toronto. The company which is undertaking the construction of the line, secured a franchise at the last session of the Dominion House enabling it to construct a line from Brockville to Toronto. It is stated that this fall tenders for construction of the line will be called for, and even some of the work may be done before the snow comes. In the early spring it is expected work will be rapidly pressed on, and part of the line be opened in the late summer of next year.

During the Exhibition 8,369,263 passengers were carried by the Toronto Street Railway Company without any serious accident. This makes an increase over last year of 1,288,680. The total earnings were $227,806.25, an increase of 13 per cent. over 1909. Wednesday in the second week was the banner day, 509,094 passengers being carried.

The new right of way into Toronto for the hydro-electric transmission line is to be over the waters of Humber Bay. The commission will expropriate the water lots needed for the right of way, and will plant the water towers in the water. The water will have to be used for about a mile east of Indian road. At the Fair grounds the line will strike land and pass along in the rear of the buildings.

The civic electrical department will plant a number of poles in King street, north side, from Yonge to York. These poles are cast iron, painted dark green, stand about 12 feet high, and have clusters of five large lights on top. They are to be placed 83 feet apart, and at intersections there will be a pole on each corner. Along the streets the poles will be placed directly opposite each other, at 83-foot distance.

The estimated cost of an underground transportation system as given by the New York firm of Jacobs & Davies, is in the neighborhood of twenty-three million dollars. The earlier estimate by local authorities was only about five million.

The Union of Canadian Municipalities in recent session here, dealt with the questions of town planning, power exportation, the abolition of level crossings, and other problems. The question of the export of power was dealt with in a resolution proposed by Mayor Williams, of Fort Frances, to the effect that no perpetual right of exportation should be granted, and that where granted it should be clearly shown to be in the public interest.

E. B. Backus, president of the Minneapolis & Ontario Power Company, and Mayor Williams, of Fort Frances, have arranged with the Hydro-Electric Commission for a report from engineers as to what price the company should charge Fort Frances for power.

Steps will probably be taken by the city council, now that the underground scheme is shelved for the present, to buy out the Toronto Street Railway Company and make arrangements with the radials for entrance to the city.

The agreement recently reached between the Toronto Street Railway and its conductors and motormen is for two years.

The street railway receipts for August were $386,805.93, as against $343,558.08 in the corresponding month last year, an increase of $43,247.85. The city's percentage was $77,361.19, as against $68,711.62 last year, an increase of $8,649.57.

The management of the Toronto Street Railway Company have signified their intention of proceeding immediately with about 25 miles of track extensions ordered by the Ontario Railway and Municipal Board. The city has accordingly commenced tearing up the streets.

Thorold, Ont.

The work on the Foley-Rieger flume at Thorold is being rushed at night. Men are engaged upon the work, electric light bulbs being provided, and a big awning protects the workmen from possible rain. The sides and bottom of the flume are of cement.

Vancouver, B.C.

The city council has so vigorously opposed the construction of the enlarged Coquitlám dam by the B. C. E. R. Company, that the latter has practically stopped the work of construction. Mayor Lee stated at the last council meeting that if the Dominion government engineer now at the dam would approve of the plans of the company as assuring every protection necessary to the city's water supply, there would be no further opposition from the city in the completion of the dam.

In order that the B. C. E. R. may extend the system in all parts of the city and district it has been decided to postpone the erection of a new terminal depot and offices until next year.

The city's share, for the month of August, of the B. C. E. R. Company's receipts is $5,409, an increase over last year of 45 per cent. To date these payments for the year amount to $26,760.

Following a lengthy discussion of the telephone question, in which nearly all expressed themselves as opposed to a dual system, a committee was apopinted to investigate and report. The committee consists of Aldermen Enright, Ramsay and McPherson.

The Canadian General Electric Company on September 1st moved into their new and more commodious quarters, a new building at Pender and Seaton streets, where they will occupy the three first storeys with a total floor space of 20,000 feet.

The jury's report on the death, on August 4th, of a workman named McCann, who came in contact with a live wire, contains the recommendation "that the B. C. Electric Railway Company, Limited, take better steps to immediately protect their live wires."

Vancouver will be in telegraphic communication with Stewart soon. Orders have been received to proceed with the construciton of the line from Prince Rupert to Stewart, and gangs are now clearing the trail for the linemen to follow. The Vancouver-Prince Rupert line has been working for some time. The new section will be built from both ends. One gang is now working southward from the Portland canal. Another gang has started work from Prince Rupert north.

Victoria, B.C.

Several ratepayers served notice of legal opposition on the corporation of Point Grey and succeeded in having the recent by-law quashed, which granted the B. C. E. R. Company power to construct a railway along certain streets. It was charged that the by-law was unfair, and vague. Illegal voting was also claimed.

Incorporation plans are said to have been practically completed for the China Creek Water Power Company, which proposes to establish a plant and provide electrical energy for the two Albernis.

The ratepayers voted against the loan of $100,000 to the B. C. Telephone Company, to be repaid, principal and interest, in fifty annual instalments. This sum was to have been used in placing wires underground. The defeat of the by-law is said to have been due to a misunderstanding on the part of the ratepayers, of the terms of the agreement, and it is believed the matter will be voted on again at the New Year's elections.

Windsor, Ont.

The formal opening of the new St. Clair tunnel took place on Monday, September 19th. Cars are being operated electrically in limited numbers for experimental purposes only, and freight traffic will not be handled regularly before the middle of October.

Complaints about the telephone service in Windsor have resulted in the decision of the Bell Company to build a new exchange. The company has already purchased property on Goyeau street, in the vicinity of St. Alphonsus' Church, and plans are now being drawn for the new structure.

The Hydro-Electric Power Commission held a sitting in the City Hall, London, on September 22nd, to hear from the municipalities which have signed contracts with the Commission or have passed by-laws but have not yet signed contracts on the question of the terms and conditions upon which power is to be supplied to the city of Windsor.

The city of Winnipeg proposes to take legal action against the Winnipeg Electric Railway Company, claiming that the company's franchise has been forfeited on account of a breach of contract in respect to the construction of new lines.

Waneta, B.C.

The application of the Pacific Exploitation Company for permission to erect a large electric power plant on the Pend d'Oreille river near here has been granted and plans for the plant with a daily capacity of 25,000 horse power have been forwarded for consideration by the lieutenant-governor. The president of the new company is Mr. H. G. Hall, of Nelson; J. W. Falls is manager, and A. Y. Lorch, secretary. The promotors expect to furnish electric energy to the Pend d'Oreille valley, the Sheep Creek and Ymir districts, and to the Orient, Chewelah and Metaline districts on the other side of the boundary. Rumors are also in circulation that the C. P. R. is interested in the project, and that the power will be used for the electrification of part of its transportation system. W. B. Pool, of Nelson, is interested.

Winnipeg, Man.

The Manitoba Government Telephone Company commission has awarded the contract for a new exchange building to serve residents in the northern section of the city. With the opening of that exchange, and another known as Garry, in the centre of the city, the capacity of the service will be brought up to 45,000 instruments.

The tender recommended for acceptance of cables for power transmission was that of the Canadian Insulated Cable Company of Montreal. The contract involves, $51,520, being for the supply and installation of 46,000 feet of 13,000-volt three-core cable for distribution of the city's power between stations Nos. 1 and 2. Wm. Kennedy, Jr., consulting engineer.

After a recent inspection of the Winnipeg municipal hydro-electric installation, Professor Herdt said: "The conduit construction is most satisfactory; the work is over half done, and excellent in every way. Machinery for the power house will be here before contract time. The stringing of aluminium wires on the transmission towers has commenced." It is now said that power will be ready for delivery by the end of June next.

The United States Government recently granted permission to the Minnesota Power & Canal Company to divert water from Birch Lake basin to the St. Louis river. Birch Lake is situated in Minnesota, but is fed by the Rainy and Winnipeg rivers, and alarm is being felt in Winnipeg as to whether this action may not have some effect on the Canadian power plants at Point du Bois and Lac du Bonnet. The International Waterways Commission has been notified of the supposed danger and in the meantime, engineers are investigating the possibilities.

The city of Winnipeg is advertizing for a business manager for its new power undertaking.

The Eugene Phillips Company, Montreal, wire manufacturers, etc., have opened an office here in charge of Mr. W. H. Reynolds.

The Winnipeg Street Railway is trying out a new fender invented by Mr. J. M. Moorehouse.

W. E. Skinner has submitted a new proposition to the city, asking a 25-year franchise for a steam heating and power plant, including a compressed air system. The city is to control the rates to be charged and to take 2½ per cent. of the gross earnings. Also necessary electric power would be purchased from the city. Mr. Skinner undertakes to spend $100,000 before the end of 1911. The only objection to the granting of the franchise seems to be in the suggestion that the city may be encouraging a competitor in an enterprise that later it may find it advisable to itself engage in.

Waterloo, Que.

The Dominion Marble Company, of South Stukely, have submitted a proposal to build their new milling plant here, conditional, however, on a sufficient supply of electric power being available.

Welland, Ont.

Crowland Township granted by 286 votes to 2, a franchise for McLaughlin's electric railway from Welland town to Welland Junction.

Yorkton, Sask.

W. E. Skinner, of Winnipeg, is consulting engineer to supervise the installation of its thirty-five thousand dollar electric light system. Tenders will be called for immediately for steam, oil and gas producer plants and work on the pole line will commence as soon as possible. It is hoped to have the plant in operation by February 1st.

Condensed Department

Advertisements in this department will be charged at the rate of 15 cents per agate line (14 agate lines make one inch) per insertion.

Advertisers who do not wish their names disclosed may use an Electrical News Box number without extra charge.

Positions Wanted

Experienced Electrical Draughtman on high tension station design, also Junior Assistant for tracing and general engineering office work. SMITH, KERRY & CHACE, Confederation Life Building, Toronto. 10

Positions Vacant

Salesman Wanted

To sell insulating varnishes, either alone or as a side line. Must have good connection with electrical trade. Write Box 128 ELECTRICAL NEWS, TORONTO. 10

Forthcoming Convention of Railway Electrical Engineers'

At the convention of this society to be held September 27th to 30th at the La Salle Hotel, Chicago, papers will be presented on such subjects as ''Electric Lighting of Railway Cars,'' ''Axle Generating Systems,'' ''Electric Traction on Trunk Lines,'' ''Motor Driven Machine Tools,'' and ''The Illumination of Railway Passenger Stations and Machine Shops.'' An interesting feature of the convention will be the exhibits by the member companies of the Railway Electric Supply Manufacturers' Association of electrical supplies used on railways. The first public demonstration of the nickel-iron Edison Storage Battery will be given, together with exhibits of the latest achievements of the electrical inventors, including the electric ozonizer and the loud speaking telephone.

B. C. Transmission Poles

The Lindsley Brothers Company, of Spokane, Washington, have just received an order from the Quebec Railway, Light, Heat & Power Company for 700 of their British Columbia transmission line poles. This is in addition to a previous order of some 650 forty-five foot poles delivered during the month of June. The British Columbia poles are sound and very straight without being too large. The Lindsley Brothers' yards are located at Nakusp, B.C., where a stock of 20,000 poles stand ready for shipment. This firm is at present distributing a little booklet throughout Canada, outlining their specifications for poles and cross-arms.

Mr. A. E. Oakley, formerly resident engineer on the construction of the Guelph waterworks, has been appointed assistant city engineer of Prince Rpuert, B.C., under Mr. W. M. Davis.

MOONLIGHT SCHEDULE FOR OCTOBER

(Courtesy of the National Carbon Company, Cleveland, Ohio.)

Date.	Light.	Date.	Extinguish.	No. of Hours
Oct. 1	6 10	Oct. 2	5 10	11 00
2	6 10	3	5 10	11 00
3	6 10	4	5 10	11 00
4	6 10	5	5 10	11 00
5	6 10	6	5 20	11 10
6	6 00	7	5 20	11 20
7	6 00	8	5 20	11 20
8	6 00	9	5 20	11 20
9	6 00	10	5 20	11 20
10	6 00	11	5 20	11 20
11	6 00	12	5 20	11 20
12	10 30	13	5 20	6 50
13	11 40	14	5 20	5 40
15	0 50	15	5 30	4 40
16	2 00	16	5 40	3 30
17	3 20	17	5 40	2 10
18	No Light	18	No Light	
19	" "	19	" "	
20	5 40	20	8 10	2 30
21	5 40	21	8 50	3 10
22	5 40	22	9 50	4 10
23	5 40	23	10 50	5 10
24	5 40	25	0 00	6 20
25	5 40	26	1 10	7 30
26	5 30	27	2 10	8 40
27	5 30	28	3 20	9 50
28	5 30	29	4 30	11 00
29	5 30	30	5 30	12 00
30	5 30	31	5 40	12 10
31	5 30	Nov. 1	5 40	12 20
		Total............		240 50

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Electrical News

Generation, Transmission and Application of Electricity

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ADVERTISEMENTS.

Orders for advertising should reach the office of publication not later than the 20th day of the month preceding date of issue. Changes in advertisements will be made whenever desired, without cost to the advertiser.

SUBSCRIPTIONS.

The "Electrical News" will be mailed to subscribers in Canada and Great Britain, post free, for $1.00 per annum. United States and foreign, $2.00. Remit by currency, registered letter, or postal order payable to Hugh C. MacLean, Limited.

Subscribers are requested to promptly notify the publishers of failure or delay in delivery of paper.

EDITOR'S ANNOUNCEMENT.

Correspondence is invited upon all topics coming legitimately within the scope of this journal. Subscribers can materially assist by sending in news items and information regarding electrical development in all parts of Canada.

Vol. 19 Toronto, November, 1910 No. 11

Review of Ontario's Hydro-Electric System

The system of power distribution which the Ontario Government is now carrying to completion with all reasonable haste, represents what is undoubtedly a near approach to the ideal conception of a Government's function, viz., by administrative and financial assistance, the making possible, in a few short years, in any certain section of its constituency, such a rapid industrial development, as, without such assistance and under natural conditions, could scarcely be looked for in as many decades. The section that may be designated as southwestern Ontario comprises a thickly populated rural community and a large number of cities and towns, all alive, as their actions have shown, to the need of light and power. The power in this case was waiting ready for development but, unfortunately, just beyond their grasp. The Ontario Government is simply lending its aid to bring into closer relationship, and under the most favorable conditions, the complementary factors of demand and supply. The completion of a section of the transmission system and the formal opening being held in Berlin at the hour of writing seemed to offer a most opportune moment for a complete resumé of the history and successful progress of the whole stupendous undertaking. It is hoped that in the following pages our readers will find that no link in the chain of development progress has been omitted, but, where minute details are lacking we ask you to consider that fifty pages is all too short and that were all the descriptions as detailed or as technical as some may wish many such volumes would be required. Further, we have used throughout a phraseology which is practically untechnical, knowing well that for information of a more technical nature other sources, the Commission or their engineers, are readily accessible.

Niagara Power in Windsor

The various municipalities in the Niagara Hydro-Electric area, in recent session, expressed themselves as being in favor of allowing Windsor to export fifteen or twenty thousand horse power to Detroit. This acquiesence on the part of the municipalities might apparently have been a foregone conclusion inasmuch as each of them stands to profit, financially, to the extent of something like 10 per cent. in the reduction of power prices originally quoted by the Commission.

The question of the wisdom or otherwise of such a policy is, it would appear, of quite secondary consideration with many of these municipalities and this attitude only emphasizes the ludicrous inconsistencies that exist in many municipal operations. Within the year the question of export of power at the Long Sault on the St. Lawrence has met, and rightly we believe, the almost united opposition of Canadians. Still more recently the most bitter warfare has been waged in Fort Frances with general sentiment entirely opposed to export. The present case does not appear to differ in any material way, except that it may mean a small financial gain for the present. The situation may easily be made a difficult one for the Government and for the Commission. It is quite conceivable that if the municipalities of southwestern Ontario persist in selfishly demanding the export of power by Windsor to gain thereby their own little reductions in price the Government may be practically forced to give its consent.

But the important point to consider is that this act would weaken, tremendously, the possibilities of standing out against such invasions at the Long Sault or the St. Frances propositions. It would commit the Ontario Government to a policy diametrically opposite to that which an almost united Canada has demanded of the Dominion Parliament, and on the very vital question of conservation of our national resources we should have our two Governments following conflicting policies where the very closest harmony is absolutely necessary.

The "sop" to the municipal consciences, the insertion of a proviso that such power may be withdrawn when required for Ontario's purposes, is not seriously taken by anyone. The execution of such a provision would be an absolute impossibility and if attempted would probably precipitate Government entanglements the results of which might be far reaching.

This selfishness of the municipalities which travels, at home, under the name of philanthropy is also cropping up in one or two places in the form of a very unsportsmanlike attitude towards existing companies. One municipality is asking to be allowed to fix its own rates because, owing to keen competition, it may be necessary, to quote one of the aldermen, to sell below cost for a while in order to crush out the present company. Propositions of a more or less similar nature come from other points. Is this Ontario's ideal of municipal government—to use the credit of the whole province, mine in Toronto, yours in Ottawa or Hamilton or London or Port Arthur, to crush an absolutely legitimate, honestly conducted business in some other town—a business that up to the present time, too, has been the life and soul of that town?

We wish every success to the Hydro-Electric undertaking and the cheapest possible power to the municipalities served, but we stand first for sportsmanlike treatment of competitors and the framing of a national policy of conservation.

Welland Sub-Station of N. S. & T. Ry. Co.

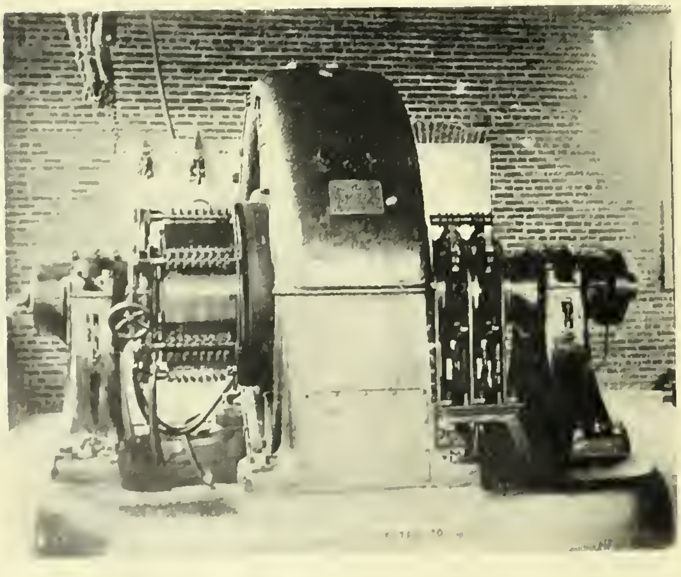
New Sub-Station to Supply Railway Extensions—Power Supplied by Electrical Development Company—Capacity for 1,000 Kilowatts

A new substation has recently been erected and put into operation on the Welland branch of the Niagara, St. Catharines and Toronto Railway, at Welland, Ont., a view of which is shown in Fig. 1. This building is entirely fireproof, with the exception of the doors and window frames which are wood.

The main part of the building is of red brick, the sills and arches of the windows being concrete, with roof of concrete, reinforced with Trussit manufactured by the General Fireproofing Company, of Youngstown, Ohio, supported by "I" beam purlines. The main floor is of concrete reinforced with expanded metal and also supported on "I" beams. The high and low tension cables of transformers and rotary converters are nearly all below the main floor in the basement, which gives a neat appearance in the sub-station. The building is made large enough for two units, but at present only one is installed. The other unit will be installed as soon as the increase of business warrants it.

Sub-Station at Welland—N. S. & T. Railway Company

All the electrical machinery in this sub-station was made and installed by the Canadian General Electric Company of Peterboro, Ont., and consists of one 500 k.w. single-phase, 600-volt, 500 r.p.m. rotary converter, which is shown in Fig. 2. Three single-phase oil-cooled transformers, shown in Fig. 3, each of which has a rating of 185 k.w. at 12,500/430 volts. One 75 k.v.a. oil-cooled reactance, and an F. K. 2,300 amperes, 15,000-volt T. P. S. T. K.2 automatic oil switch installed in a brick cell on the floor of the station, behind which are the electrolytic lightning arresters. Above the platform shown are the disconnecting switches on the line entering the building.

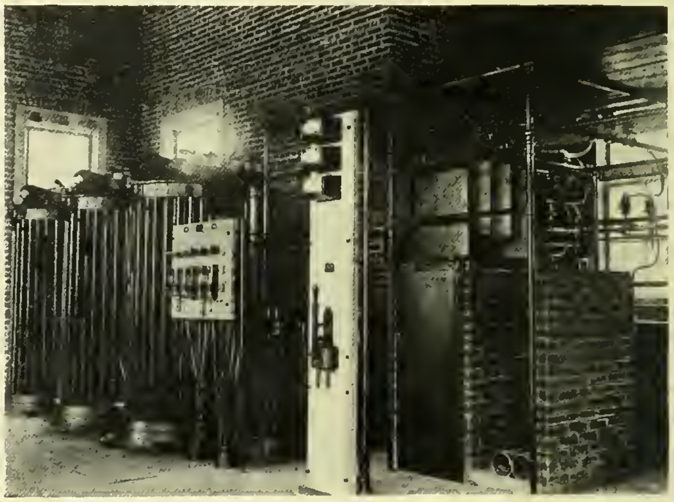


Rotary Converter in Welland Sub-station

The a.c. panel is provided with the 12,000-volt switch operating handle with special trip coils. There are also on this panel one voltmeter, one ammeter and power factor indicator.

The current transformers are installed in the basement and the potential transformers are supported by the pipe frame work to the right of the a.c. panel (not shown in picture).

The d.c. switchboard consists of three panels, one of which is the rotary panel and the other two, feeder panels, one feeder going north towards Thorold, and the other south toward Port Colborne on Lake Erie, a section break being placed in the trolley just outside the station.



Transformers and Oil Switches—Welland Sub-Station

The power for the substation machinery is supplied by the Electrical Development Company, of Niagara Falls, Ont., and to do this a transmission line had to be constructed by the Railway Company on their own right-of-way between Thorold and Welland, a distance of 11 miles.

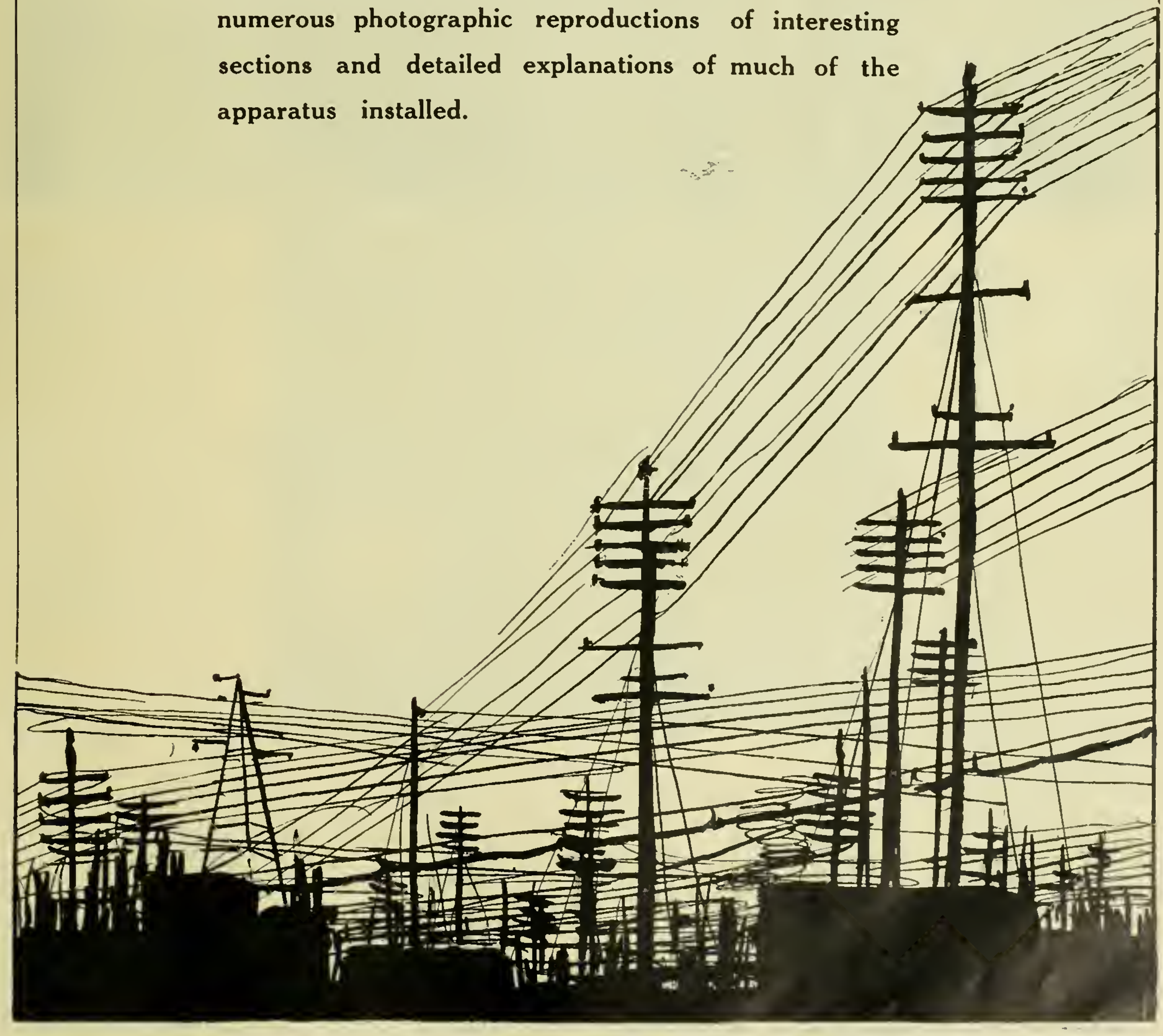
The substation and transmisison line were designed by W. H. Horton, electrical engineer of the Railway Company, who also made the plans in connection therewith and superintended the work of construction.

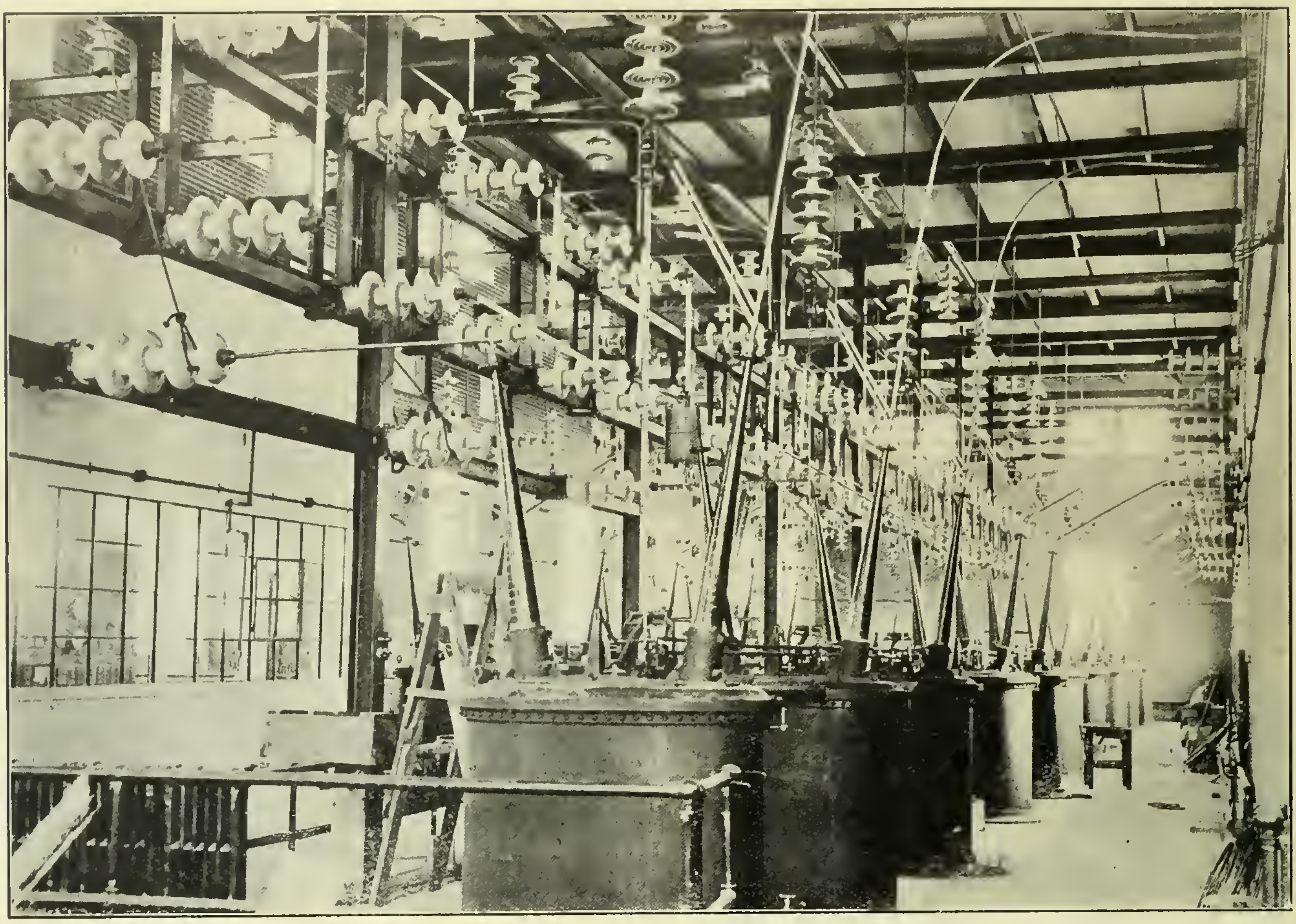
Parke & Leith, Canadian agents British Aluminium Company, have opened new offices and warerooms at 24 Adelaide street west, Toronto.

Messrs. Vandeleur & Nichols have appointed Mr. H. S. Albertson their representative at Galt, Ont., and Mr. A. P. Berry, their representative at 263 St. James street, Montreal, Que. A recent order sent in by their Montreal office was for a Reavell Compressor driven by a Bruce Peebles motor for the Montreal Street Railway Company.

NIAGARA POWER IN SOUTH-WESTERN ONTARIO

The complete story of the construction of the Ontario Hydro-Electric System, including descriptions of the Power House, the Substations, the Transmission Lines, the Telephones, and the chief local distributions with numerous photographic reproductions of interesting sections and detailed explanations of much of the apparatus installed.





INTERIOR OF INTERSWITCHING STATION AT DUNDAS

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The Makers of Electrical Canada—5

P. W. SOTHMAN—"HYDRO-ELECTRIC" ENGINEER

Mr. P. W. Sothman was born in Haderselv, Denmark, in the year 1870. Though a young man, his experiences have been world wide, and the recognition of his successful work not less so. He has endured his quota of naval training; he has served his time in the shops, in Hamburg, as the custom in that country is before entering the university; he has graduated with the E. E. degree from Charlottenburg University in Berlin; he has received the degree of Doctor from the Académie Parisiènne; he has worked several years in the laboratories of the Siemens, Halske Engineering & Manufacturing firm—the largest and most prominent on the European Continent; he has built and operated, as early as 1894, in Grünberg, Silesia, the first really high tension transmission line, operating at 25,000 volts, the highest voltage thought to be practicable at that time; he has established and successfully operated large power plants at Johannesburg, South Africa; he has done similar work at various points in Russia; he has later, while a director of the Allgemeine Electricitats Gesellschaft, acted for seven years as general manager and technical director of the power plant and distribution system of Strasburg, extending it to serve 97 municipalities. Finally he has just witnessed the successful opening of his 283 miles long, 100,000 h.p. capacity, 110,000 volt pressure (still the highest in the world) transmission line system with its eleven substations and soon to serve more than 20 large municipalities and a half million people — and yet, he is a young man, in years, in appearance and, more than all, in action.

MR. P. W. SOTHMAN

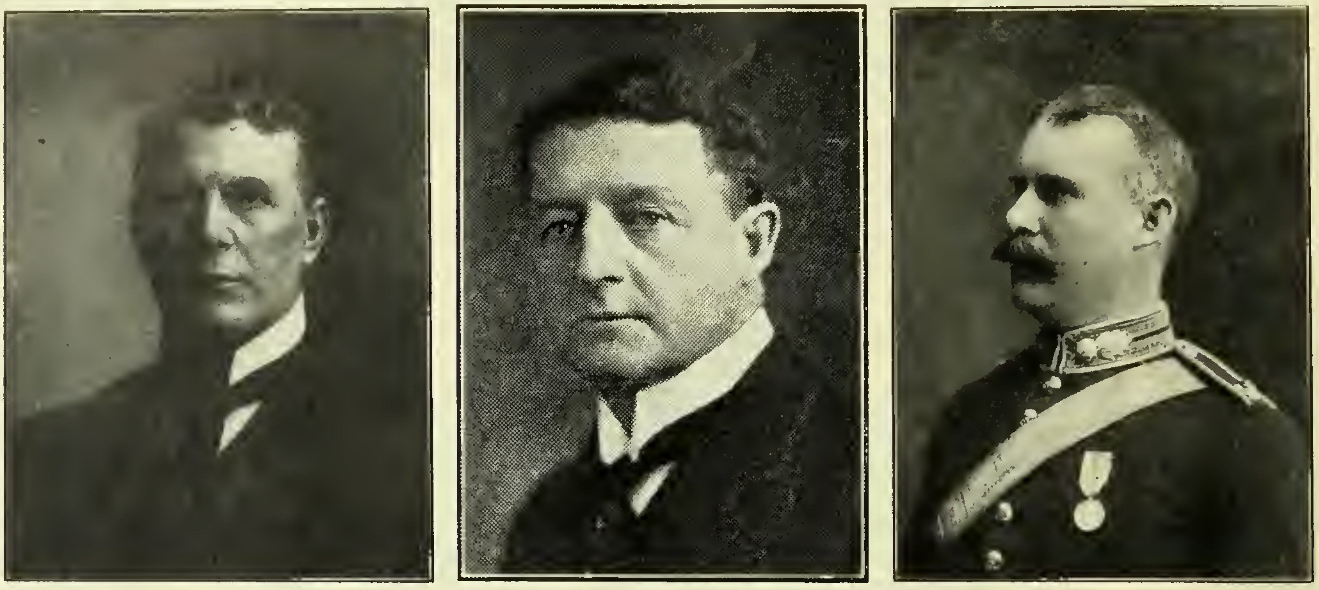
Taking his ability for granted, Mr. Sothman has two exceedingly prominent characteristics — independence and thoroughness. Four years ago the successful completion of Ontario's Government transmission scheme at this present time could have been utterly foiled by an unwise appointment to the position of chief engineer. The requirements called for able work and thorough work, but above all this, the demand was for a man absolutely impervious to personal or political or financial influences.

Chief Engineer Sothman is just that man. Both by nature and circumstances he is so, in this case. By nature, because he was born and educated in an atmosphere where integrity in municipal operations is an hereditary trait. By circumstances, because, happily for himself and thrice happily for the municipalities he serves, he arrived fresh on the scene knowing no distinction between Conservative and Liberal—knowing none and apparently caring none—just as he is to-day. Thoroughness, too, has been his watchword at every turn, in the location of the line, in the choice of insulators, of towers, of cables and of all other material. To the uninitiated, the caution exercised has at times seemed excessive and even those in closer touch with his work have mildly remonstrated — always, however, with the same result, that the whole work is constructed absolutely according to the ideal of the chief engineer. Without doubt the power users of Ontario will ultimately recognize the value of this thorough foundation and the Government congratulate itself on this wise appointment to which more than to any other single act they to-day owe the successful completion of their extensive construction enterprise.

The harmony that exists on the Hydro-Electric flat in the Continental building is one more splendid proof of the faith of all in their chief engineer.. Mr. Sothman has been particularly happy in his choice of assistant engineers, to whom he generously credits much of the success of his first Canadian undertaking. Space does not permit any detailed description of their work but justice requires that mention, at least, be made of such men as Gaby, Acres, Stocking, Brundige, Brandon, Mansbendel, Davidson, Yates and McBride, who by their loyalty to their chief no less than by their untiring energy have helped to make Ontario's big municipal scheme possible.

Mr. Sothman is a member of the I.E.E., the A.I.E.E., and the Canadian Society of Civil Engineers. He has always taken the keenest interest in the work of these and other associations and by his lectures in various parts of Canada on the work of the engineering side of the Hydro-Electric scheme has done much both to quicken the interest of the public and to educate them in electrical matters.

Cleveland has a vacuum street cleaner which will, it is said, do the work of forty men.



W. K. McNaught, M. P. P. Hon. Adam Beck, Chairman. Lt-Col. J. S. Hendrie.

The Three Members Composing Ontario's Hydro-Electric Power Commission.

HISTORICAL

Progress dates from April 1900—Agreements between Commission and Company and Municipalities—Where Power is Taken

The history of the development of the scheme of Government assistance in the matter of Niagara power distribution, which is being worked out in Ontario, dates as far back as the year 1900. On the 25th of April in that year the first concrete step in line with the growing sentiment of some form of Government control was taken in the appointment of a committee, by the Toronto Board of Trade, of which the late Mr. W. E. H. Massey was chairman. The investigation, naturally, had particular reference to the needs of Toronto, but in the report submitted by that committee it is significant to note the following words: "Our hope for cheaper power is to bring the current from one of the great Niagara generating plants." "The Toronto Electric Light Company have signified their intention of bringing power from Niagara Falls, and the question arises whether or not Toronto, as a city, should control this proposed Niagara power connection. . . ."

Later, in the early part of 1902, several meetings of representatives of different cities in the province, as well as from the Canadian Manufacturers' Association and Board of Trade, were held, and matters pertaining to Niagara power discussed.

Up to this time two franchises had already been granted on the Canadian side of the Niagara river to private corporations, viz., the Canadian Niagara Power Company to generate 100,000 h.p. and the Ontario Power Company to generate* approximately 180,000 h.p., and a little later one with a right to generate 125,000 h.p. was granted to Col. Sir Henry Mill Pellatt, and Messrs. Frederic Nicholls and Wm. Mackenzie, who subsequently became the "Electrical Development Company."

On June 9th, 1902, a meeting of the manufacturers of mid-western Ontario was held at Berlin, at which were present representatives from Toronto, Galt, Guelph and a number of the surrounding towns, to confer respecting the best method of securing electric power for manufacturing purposes from Niagara Falls. The chief speaker at this meeting was Ald. F. S. Spence of Toronto, who suggested "that the municipalities should ask for the appointment of a Government Commission which would have the power to arrange for the transmission of electricity to the various municipalities desiring it; this Commission to issue its own bonds in payment of transmission lines, which bonds would be covered by bonds of municipalities interested. That under this scheme the Government through a Commission should undertake the transmission to the municipalities desiring power, the latter guaranteeing by their bonds the cost of construction and selling in turn to all manufacturers at an even rate, in this way preventing the power from falling into the hands of any monopoly, and further securing at an early date to the industries of this province the advantages of cheap electrical energy."

In July, 1902, the matter was again taken up at a meeting of the municipal representatives held at Berlin, and W. B. Snyder, D. B. Detweiler and Ald. F. S. Spence were appointed a committee to obtain information. This committee prepared a report which was read at a meeting called at Berlin, 17th February, 1903, which was attended by about 90 municipal and manufacturing representatives. The report stated that, after discussion with the officials of the various power companies, the committee believed that power could possibly be obtained in large quantities at a price of about $7 to $8 per continuous horse power per annum, delivered at Niagara Falls, or from $14 to $15 per horse power delivered to the various municipalities. The report also recommended that prompt action be taken to obtain from the Legislature powers enabling municipalities to purchase and sell power, and to co-operate, to develop and transmit or distribute electrical energy, or to buy power and to sell and distribute the same to the several municipalities.

After discussion of the report, Mayor Urquhart of Toronto submitted the following motion, which was carried:

"That we respectfully suggest and urge upon the Government of Ontario the advisability of the Government building and operating, as a Government work, lines for the transmission of electricity from Niagara Falls to the towns and cities of Ontario, and that for this purpose they issue debentures which might be guaranteed by the Government, but which would be eventually paid out of the receipts from the sale of electrical energy, thus entailing no charge upon the provincial funds, and that the municipalities here represented call their representatives in the Legislature to urge upon the Government to carry out this resolution.''

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* The actual agreement allows the Ontario Power Company to withdraw water from the Niagara river by three circular, 18-foot diameter, pipes or their equivalent. These are calculated to generate about 60,000 h.p each

In the month of January, 1903, the city of Toronto made application to the Legislature of Ontario for the right to generate and transmit Niagara Falls power for the uses of the city. This application was, however, refused.

On the 27th of February, 1903, a committee waited upon the Government and were promised a measure giving the municipalities the right to transmit power from Niagara Falls and to co-operate for that purpose. In furtherance of this promise, on the 12th of June, 1903, an Act was passed by the Legislature of the Province of Ontario entitled ''An Act for the construction of municipal power works and the transmission, distribution and supply of electrical and other power and energy. (3 Edward VII., Chap. 25). This Act authorized any two or more municipalities to appoint commissioners to examine into and report upon the desirability of establishing works for the production of power, heat and light, the probable cost of such works, the desirability of the undertaking, and the proportion of the cost to be borne by each of the contracting municipalities. This Act also conferred upon the municipalities the power to accept the report of the Commissioners, and to carry out the works under a Board of Commissioners to be appointed by the Chief Justice of Ontario, which Board were granted very wide powers for the acquirement or construction of works for the generation, transmission and distribution of electrical and other power and energy, and for the fixing of the rate or price which should be charged for the power in each instance. Authority was also granted for the issue of bonds for the carrying out of the works.

Acting under the powers given in the Act above recited, a meeting of the representatives of the seven municipalities chiefly interested was held in Toronto on the 12th of August, 1903; money was voted and a Commission formed, consisting of four prominent manufacturers of the province, viz., Messrs. E. W. B. Snyder, Waterloo; Adam Beck, London; W. F. Cockshutt, Brantford; and P. W. Ellis, Toronto. Associated with them were Prof. Fessenden, of Washington, D.C., electrical engineer; R. A. Ross, electrical engineer, and Henry Holgate, hydraulic engineer, both of Montreal. This Commission prepared a very comprehensive report of some 76 pages, giving full information upon the subject referred to them, which was published under date of March 28th, 1906.

A new Government in the meantime having come into power, Sir James Whitney, Premier, the Hon. Adam Beck, who, as a member of the first Commission, had studied the conditions and appreciated the almost insurmountable difficulties attending the grouping together of a number of municipalities for this specific purpose, again took the matter up with the Government, of which he was a member, with the result that on July 5th, 1905, a permanent Hydro-Electric Power Commission of the Province of Ontario was incorporated by the Legislature (5 Edward VII., Chap. 19). The Commission was composed of the Hon. Adam Beck, chairman; Geo. Pattinson, M.P.P., of Preston; and Mr. P. W. Ellis, of Toronto, commissioners. Owing to ill-health, Mr. Ellis resigned and Mr. John Milne of Hamilton was appointed in his stead. Cecil B. Smith, Ma.E., acted in the capacity of chief engineer. The Commission made an exhaustive investigation into the water powers of the province, both developed and undeveloped. The scope of the investigation was very wide, and resulted in the publication of five valuable reports, one of which dealt exhaustively with the Niagara district, covering the territory between Niagara Falls and the Detroit and St. Clair rivers.

The investigations of this Commission showed that the development and transmission of electrical energy from Niagara Falls was thoroughly practical, and seemed to indicate that it could be sold at a lower rate than was being charged by the companies in existence at the time.

Following this investigation and report, a deputation was appointed from the different cities and towns throughout the province to wait upon the Government. The latter carefully considered the views of the deputation, and with the approval of a majority of the members of the Provincial Legislature on both sides of the House, appointed a second Commission in May, 1906 (6 Edward VII., Chap. 15). The Commission was composed of the Hon. Adam Beck, chairman; Hon. John S. Hendrie, of Hamilton, and W. K. McNaught, M.P.P., of Toronto; Mr. P. W. Sothman was appointed chief engineer. This Commission was invested with all the powers necessary to control the rates to be charged for light and power by various companies utilizing water powers in the province, to build and construct all necessary works, and to take such steps as would place electrical energy for power and light within reach of the greatest possible number of people. This Commission has throughout worked with the ''Niagara Power Union,'' an organization composed of the representatives of the different municipalities throughout the southern and western parts of the province.

In January of 1907 by-laws were submitted by many different municipalities throughout Western Ontario to authorize the incoming councils to deal with the Hydro-Electric Power Commission for a supply of power and were carried by substantial majorities in the following cities and towns: Toronto, Hamilton, London, Brantford, Stratford, St. Thomas, Toronto Junction, Guelph, Galt, Woodstock, Ingersoll, St. Marys, Waterloo, Preston, Hespeler, Weston and Paris. Since that date other municipalities have joined the ranks.

The mandate of the people was indeed probably strong enough to have justified the Government in constructing generating works at the Falls, and obtaining the power absolutely at first cost, but in view of the fact that there were already a number of companies with generating plants on the Canadian side at this point having quantities of power available for sale, the more conservative course was followed of asking these companies to tender for a supply of power, the Government proposing for and on behalf of the municipalities to undertake the transmission of the same to the different municipalities, who in turn would undertake to distribute it to their own citizens.

Tenders were asked from the Canadian Niagara Power Company, the Ontario Power Company, the Electrical Development Company, and the Erie & Ontario Development Company, and the contract was finally awarded to the Ontario Power Company.

Agreement between Commission and Company

The original agreement, dated August 12th, 1907, required the delivery of power to the Hydro-Electric Commission at 60,000 volts, it being the original intention of the Commission to transmit power at this pressure. After careful consideration, however, and investigation as to the advisability of extending the area of distribution and in view of the successful operation of other transmission systems in various parts of the world at a much higher voltage, the Commissioners decided to raise the transmission voltage to 110,000. A new agreement was accordingly made with the Ontario Power Company under date March 19th, 1908, by which the Commission agreed to accept the power right off the Ontario Power Company's generators, i.e., at 12,000 volts.

Under the conditions of the later agreement the Ontario Power Company binds itself to deliver to the Hydro-Electric Commission any quantity of power up to 100,000 horse, due notice, of course, being given of any additional requirement. The Commission agrees to purchase exclusively from the Ontario Power Company up to 30,000 horse power but leaves itself free to purchase elsewhere one-half of any additional requirements up to the 100,000 horse power mark. Above this amount the Commission is at liberty to buy in the open market.

The price of power delivered at 12,000 volts is $9.40 per horse power per annum, but when the amount reserved and held ready for delivery upon the order of the Commission shall amount to 25,000 horse power or more the price of all shall be reduced to $9 per horse power per annum.

The Commission binds itself to pay for 75 per cent. of the power ordered to be held in reserve for its use, whether the same is used or not. With regard to peak load, the arrangement is that when the greatest amount of power taken for any consecutive twenty minutes, during any month, shall exceed 75 per cent. of the amount being held in reserve at that time, the Commission shall pay for the greater amount during that entire month.

Agreement between Commission and Municipalities

The Commission, on its part, binds itself, among other things, to transmit the required quantities of power to the boundary line of the various municipalities and hand it over at 13,200 volts. Special conditions have made it necessary to reduce the voltage in the case of Preston to half the regular amount, i.e., to 6,600 volts.

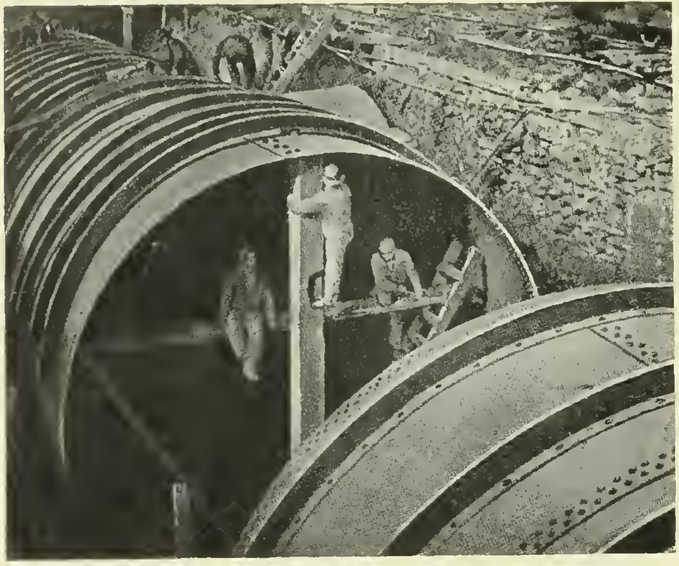


Fig. 1.—First 18-foot Water Pipe line of Ontario Power Co.

If due notice has been given by any municipality that the full amount of the original order cannot be used a reduction of 40 per cent. in the amount is allowable.

The initial cost of such transmission is advanced by the Province of Ontario, for which it issues bonds, to be retired at the end of 30 years, by the municipalities, at which date the sinking fund, which in the meantime will be yearly added to by the said municipalities, will have reached the necessary sum. The whole system then becomes the property of that section of the province it serves.

The corporations agree to take electric power exclusively from the Commission and to do their own distributing. Payment is based on the following considerations: The corporations agree

(1) To pay annual interest at 4 per cent. upon their proportionate part of the money expended by the Commission on capital account for the construction of the transmission line, transformer stations and other necessary works.

(2) To pay in addition to the above, an annual sum for their proportionate part of the cost of the line, stations and works so as to form in thirty years a sinking fund for the retirement of the securities issued by the Province of Ontario.

(3) To pay also their proportionate part of the line loss and cost of operating, maintaining, repairing, renewing and insuring the line, stations and works.

(4) To pay for 75 per cent. of the power held in reserve for them, whether used or not, and where this amount is exceeded for any twenty consecutive minutes during any month, the greater amount shall be paid for during that month.

The agreement also states that the Commission shall at least annually adjust and apportion the above amounts payable by the various municipalities.

Under these conditions it will be seen that the cost to any municipality will vary, the amount depending on the total amount of power consumed by all the municipalities, the amount consumed locally, proximity to the source of supply, and proximity to other consumers.

The Municipalities that are taking Power at Once

On May 4th, 1908, a number of municipalities, having submitted the necessary by-laws, entered into an agreement with the Commission to take stated quantities of power. Since that date this number has been constantly increasing until at the present moment 22 municipalities are in sight of Niagara power. The full list is given below, with the amounts contracted for. The calculated cost to the municipalities, at their boundary line, at 13,200 volts, is also given. From what has been said elsewhere concerning the factors determining the amounts of such cost it will be seen that these original figures are subject to variation and, very possibly, to reduction, as the number of municipalities taking power increases and the total consumption increases.

Toronto	10,000	$18.10
London	5,000	23.50
Guelph	2,500	24.00
St. Thomas	1,500	26.50
Woodstock	1,200	23.00
Galt	1,200	22.00
Berlin	1,000	24.00
Stratford	1,000	27.10
Waterloo	685	24.50
Preston	600	23.50
Ingersoll	500	24.00
St. Marys	500	29.50
Hespeler	300	26.00
New Hamburg	250	29.50
Hamilton	1,000	17.50
Weston	200	29.25
Brampton	1,300	29.40
Mitchell	200	38.50
Seaforth	500	41.25
Tilsonburg	500	30.50
Norwich	150	30.00

Requests have also been received from a large number of towns west of St. Thomas and estimates have been furnished. This matter is yet in an unsettled state, however, owing to the absence of any very large centres in that district and the consequent increased cost of distribution. If Windsor succeeds in its endeavor to purchase a large amount and export its sur-

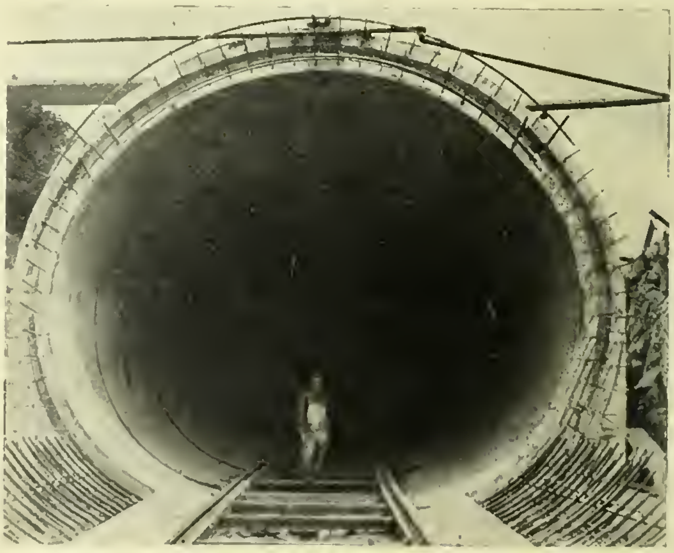
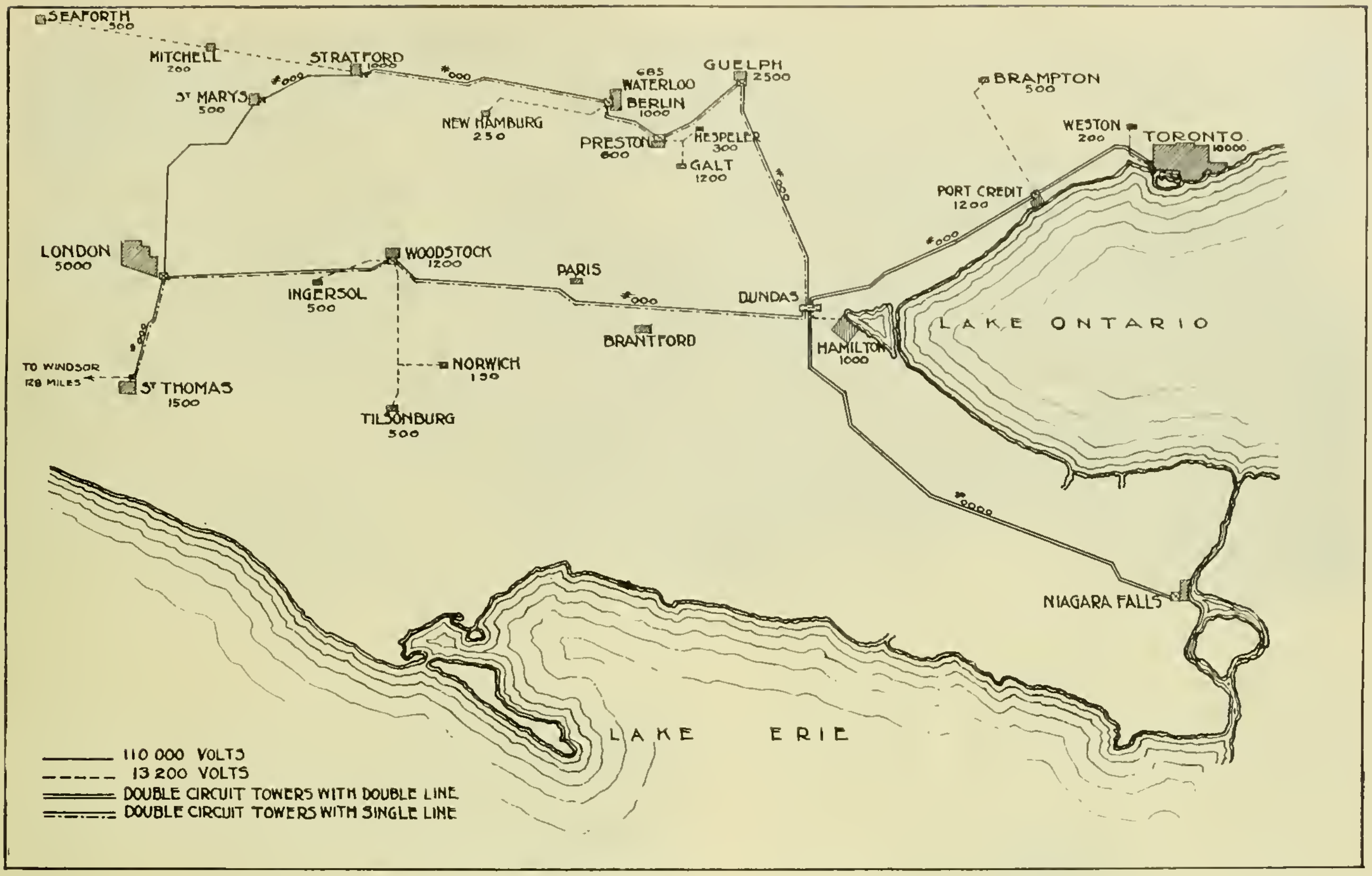


Fig. 2.—New 18-foot Diameter Water Tube Conduit.



Map Showing Municipalities Served and Power taken by Each.

plus to Detroit, much lower rates can be quoted to the towns in that locality and doubtless that section of Ontario would be the scene of great electrical activity in the immediate future. It is also said that should Windsor be enabled to accept in the neighborhood of 20,000 horse power the reduction in cost to the municipalities originally entering the power scheme would amount possibly to 10 per cent.

Still more recent requests for estimates of cost have been preferred by a number of Eastern Ontario municipalities and by-laws will be submitted in the near future. It was the original intention to extend the high voltage line east of Toronto to serve these requests, but a later plan suggests securing power from one of the existing companies in that neighborhood. If this plan, which looks cheaper, is adopted, power may be supplied to the Commission by either the St. Lawrence Power Company, of Waddington, New York State, or by the Electric Power Company, which controls a number of power propositions on the Trent Valley river and at other points in that locality.

GENERATION

Supply Obtained from Ontario Power Company—130,000 h.p. to draw on, with more in reserve—Equipment the best available.

By agreement with the Hydor-Electric Commission of Ontario, the Ontario Power Company is under contract to supply, as required, any quantity of power up to 100,000 horse power. The Ontario Power Company's generating station is located at

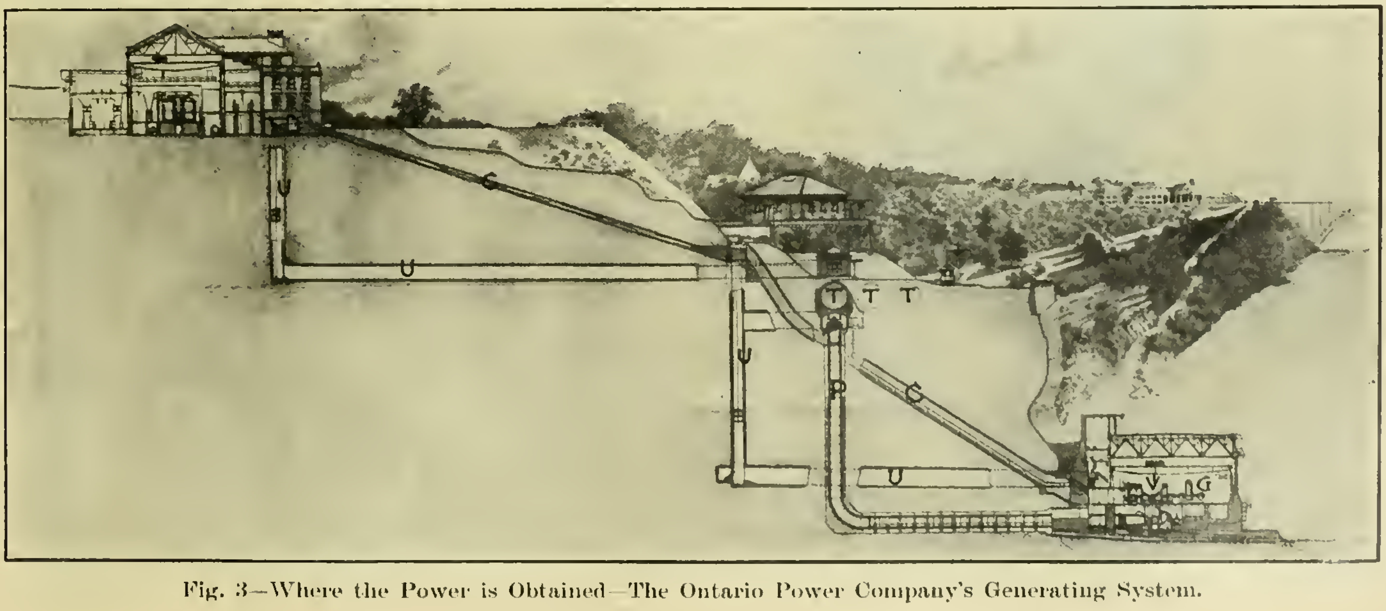


Fig. 3—Where the Power is Obtained—The Ontario Power Company's Generating System.

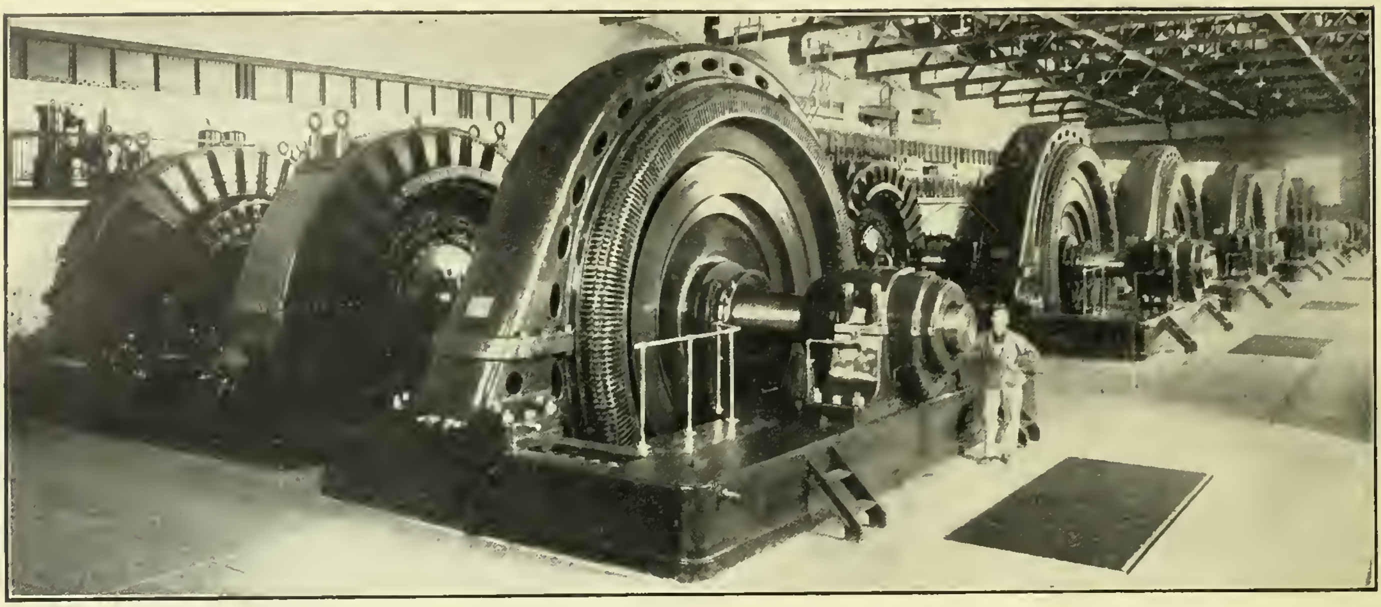


Fig. 4.—Where the Power is Obtained—6 units shown, being increased to 10—The Ontario Power Company.

Niagara Falls on the Canadian side. The generating station is located just below the falls close to the water's edge. Up to the present year water has been supplied to the turbines through one, 18-foot diameter, circular steel pipe (fig. 1), which runs underground, along the bank of the river to the intake, some 6,300 feet up stream. This pipe has carried sufficient water to operate six generators with a combined capacity of about 66,000 horse power. During the last year, however, the demands of the Ontario Hydro-Electric Commission have been anticipated and the doubling of this original capacity is now well advanced. A second water pipe of such a size as to be equivalent to a circular 18-foot diameter tube has been constructed, a seventh generator of 12,000 horse power installed, and another, No. 8, of 12,500 horse power capacity, is now being assembled. In addition, two other generators of the same size as No. 8 are now under construction. The first seven generators were built and installed by the Westinghouse Electric & Manufacturing Company. The order for Nos. 8, 9 and 10 is being filled by the Canadian General Electric Company.

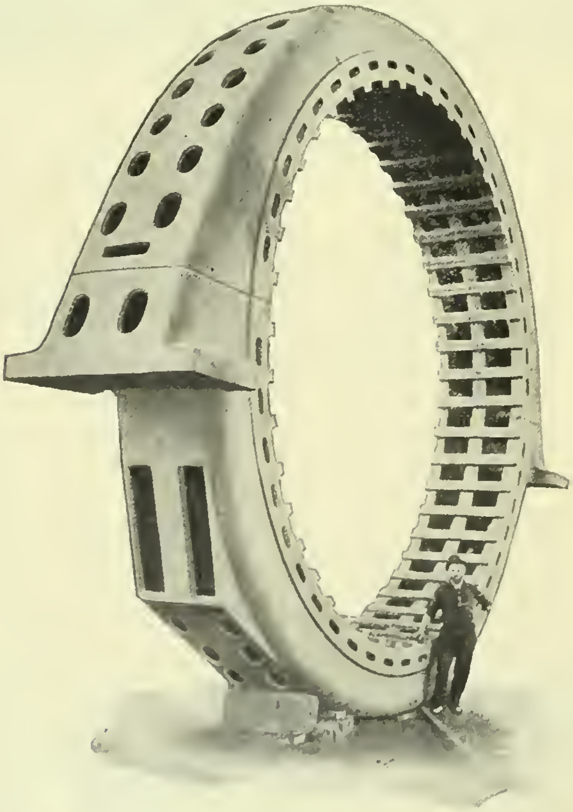


Fig. 1a—Casting of one of three C.G.E. Generators being installed for the Ontario Power Company.

The second water pipe was placed in commission on the 25th of July of the present year. It is built of reinforced concrete and is the first example of the application of reinforced concrete to pressure pipe construction of anything like this magnitude anywhere in the world. The pipe is laid in a trench a few feet below the surface of the ground. When the filling in of this trench is completed the park will appear as usual, the conduit being entirely concealed.

The conduit (fig. 2), which has an effective internal diameter of 18 feet, is 6,300 feet long, connecting the company's headworks at Dufferin Islands with its distributor just below Table Rock. Its walls have a thickness of 18 inches, and are composed of reinforced concrete, both longitudinal and circumferential bars being used, as shown in the figure. It is of oblate form, the flattening being more pronounced on the bottom than on the top, this form being used for both engineering and economic reasons. It rests throughout its entire length on a concrete foundation. It is connected also by by-passes, with the first conduit, so that a portion of its power may be immediately available through the apparatus already in operation.

An interesting feature of the work of construction of this concrete tube is the fact that all the materials used have been of Canadian origin or manufacture, the two chief ingredients, the cement and the steel, having been purchased from two of the power company's own customers, the Canadian Portland Cement Company and the Ontario Iron & Steel Company.

The plan of the generating station of the Ontario Power Company is shown in vertical cross-section in figure 3. T.T.T. represent the three openings through which the water pipe lines enter with their supply of water, each for six penstocks. Two pipe lines, as already noted, are now in use. P shows one of the penstocks, the others being ranged in a row behind the first. Each penstock is of steel and 9 feet in diameter. These penstocks lead vertically downward, through electrically operated valves, located in a room hollowed out of the solid rock, to a level slightly below that of the generating floor, then, turning at right angles, lead horizontally to the turbines. C indicates a cable tunnel and conduit system leading from the generating station to the company's own transforming and distributing station on the hill behind the generating plant. The power is carried in lead covered cables. Similar conduits now carry power to the Hydro-Electric step-up station, but these are not shown on the figure. V shows the position of one of the double runner turbines and G one of the generators. U is an underground passageway lined with concrete and with elevators as shown, connecting the various parts of the system.

A reproduction of the first six generators installed in this power house is shown in figure 4. The new units are similar in appearance. A good idea of the size of these generators is obtained from figure 5, which shows the steel casting for one of the generators now on order and which was manufactured in the shops of the Canada Foundry Company. The generators are all of the horizontal shaft type, 187½ r.p.m., 3 phase, 25 cycles, 12,000 volts.

The turbines are all of the inward flow horizontal twin type, capacity 12,000 horse power each, normal, under a 175 foot head and were manufactured by the J. M. Voith Company, of Heidenheim, Germany.

The governors for the first seven units are three Voith and four Lombard manufacture. The new governors are also of Voith manufacture. They are of the relay type, operated by oil under pressure. In principle they consist of fly balls, driven from the turbine shaft, which actuate a small regulating valve, which in turn controls a main valve admitting oil to either end of a cylinder whose piston actuates the turbine gates. A mechanical relay, operated by the movement of the gates, reacts on the reacting valve in such a manner as to prevent surging.

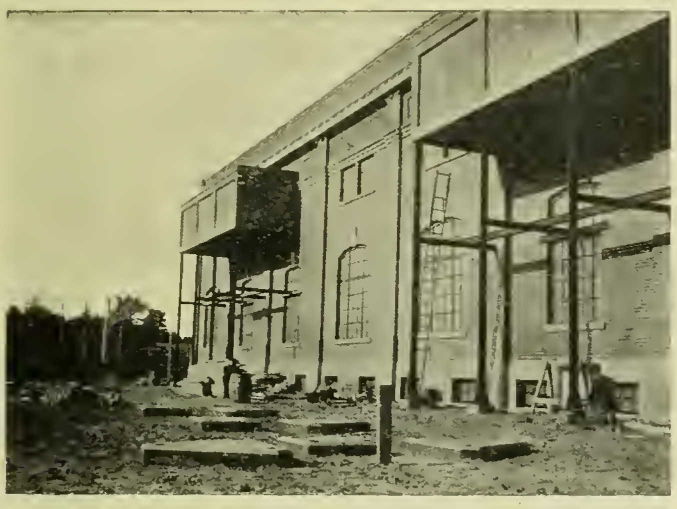


Fig. 5—Showing Protective Hoods on rear of Niagara Station

The present exciter plant consists of two 375 k.w., 250 volt Westinghouse D.C. generators driven by Stilwell-Bierce & Smith-Vaille Victor Gerard wheels on one end and on the other by 250 h.p., 2,200 volt Canadian General Electric Company induction motors. No additional exciter capacity is required for the operation of units 8, 9 and 10.

NIAGARA

Voltage Stepped Up from 12,000 to 110,000—Ultimate Capacity of Station 72,000 kilowatts —Leading-in Cables Fully Described.

The Ontario Power Company's generators are connected with the Hydro-Electric transforming station by an underground conduit system some 2,500 feet in length. Distributed over this distance there are eight manholes. The materials for this conduit system were supplied and its construction carried out by Canadian Contracts, Limited, of Toronto.

Through these conduits the current is carried by six high tension cables, the particulars of which are as follows: The type of cable is 3 phase, segmental cored, paper insulated, lead cased. The cross-section is 300,000 circular mils., the number of strands per conductor 33, the total length 13,000 feet, the working pressure 12,000 volts. The overall diameter of the cable is 2.88 inches, the insulation thickness around each conduit .25 inches, the insulation thickness over all .25 inches, the thickness of the lead sheath .125 inches, the weight of cable per foot 10.42 pounds, the electrostatic capacity per mile between cores .20 microfarads, the permissible bending radius at 40 degrees F. 18 inches. The cables were supplied in average lengths of 300 feet, there being 36 joints in all. The cables stood a satisfactory test, at the factory, of 50,000 volts between each pair

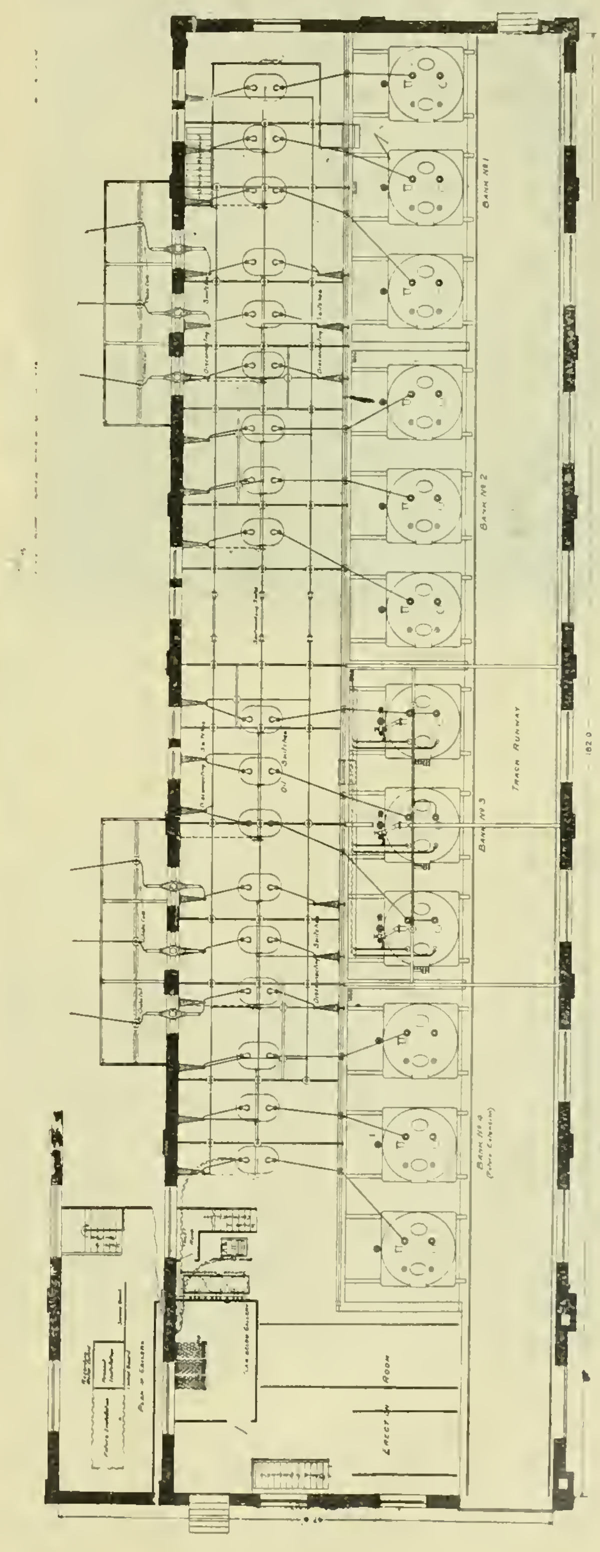


Fig. 6.—Layout of Transforming and Switching Apparatus in Niagara Station.

of conductors, and between each conductor and the lead sheath for a period of five minutes. The required test, after installation was 30,000 volts between the same points for the same length of time.

Two cables will be permanently operated together in parallel to supply one bank of three step-up transformers, having a capacity of 9,000 kilowatts. These cables were installed by Siemens Brothers Dynamo Works, of London, England, and are guaranteed for five years.

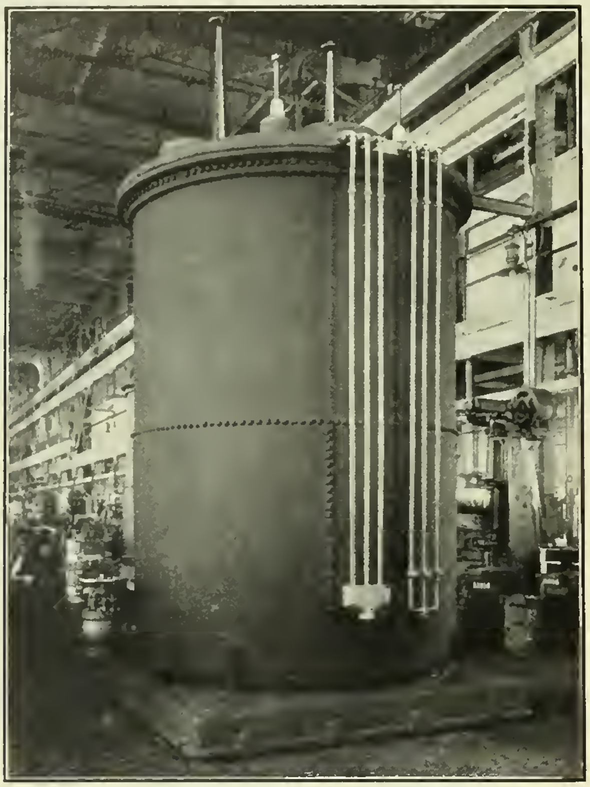


Fig. 7—3,000 k.v.a. Westinghouse Transformer, 12,000 to 110,000 volts, Niagara Falls.

The Niagara Station

The current is generated at 12,000 volts by the Ontario Power Company and before leaving this company's station is passed through a group of oil switches with the proper automatic cut-out devices. Leaving the oil switches, the current is transmitted through the underground cable, described above, at 12,000 volts for a distance of about 2,500 feet to the Commission's step-up transformer station, where it again passes through oil circuit breakers. These are also equipped with overload relays so that in case anything should happen behind these switches they will cut out before the switches in the Ontario Power Company's station. From the 12,000 volt switches the current is brought to the main busbars and through a second bank of oil circuit breakers to the step-up transformers. At present there are nine 3,000 k.v.a. single phase transformers which are so arranged that the voltage on the high tension side can be increased by about 20 per cent. above 110,000, i.e. to 132,000 volts. From the high tension side of the transformers the current is transmitted through disconnecting switches, and high tension oil switches, on to the high tension (110,000 volts) busbars. The high tension busbars as well as all high tension wires consist of copper tubes one inch in diameter. The 110,000 volt busbars are spaced 6 feet apart and in no place is a conductor closer than 3 feet 6 inches to the brick wall or steel work of the building. From the high tension busbars the current passes again through disconnecting switches and through oil circuit breakers on to the transmission line within the building. The line exits are built up in very heavy porcelain tubes carried on porcelain supports through a five-foot square in the wall closed by four plate glass sheets through a centre opening in which the line passes. After exit the current passes through choking coils. At this point also the lines are supplied with electrolytic lightning arresters and horn gaps.

The complete electrical equipment for the Niagara station was furnished by the Canadian Westinghouse Company from their shops in Hamilton, and a somewhat detailed description of the transformers, high tension circuit breakers, electrolytic lightning arresters and low tension circuit breakers follows:

The nine 3,000 k.v.a. transformers are oil insulated, water cooled, designed for operation on 12,000 volts low tension, 110,000 volts high tension, and star connected, with ungrounded neutral; these transformers are of the shell type and equipped with the Westinghouse condenser type of bushing, which bushing is claimed to have a distinct advantage over any previous article for use on very high voltages. The insulation of these transformers is of the Westinghouse "box type," which insulation is of a rigid character, formed to exact shape and dimensions on special dies and jigs. This type of insulation has the advantage that in case repairs are necessary, it can be used over again.

The five 110,000 volt type "GA" 3 pole circuit breakers are electrically operated, these breakers being also equipped with the Westinghouse condenser type bushing, and owing to the design of the switch no concrete barriers or brick work whatever are required. The design of these switches is such that gravity

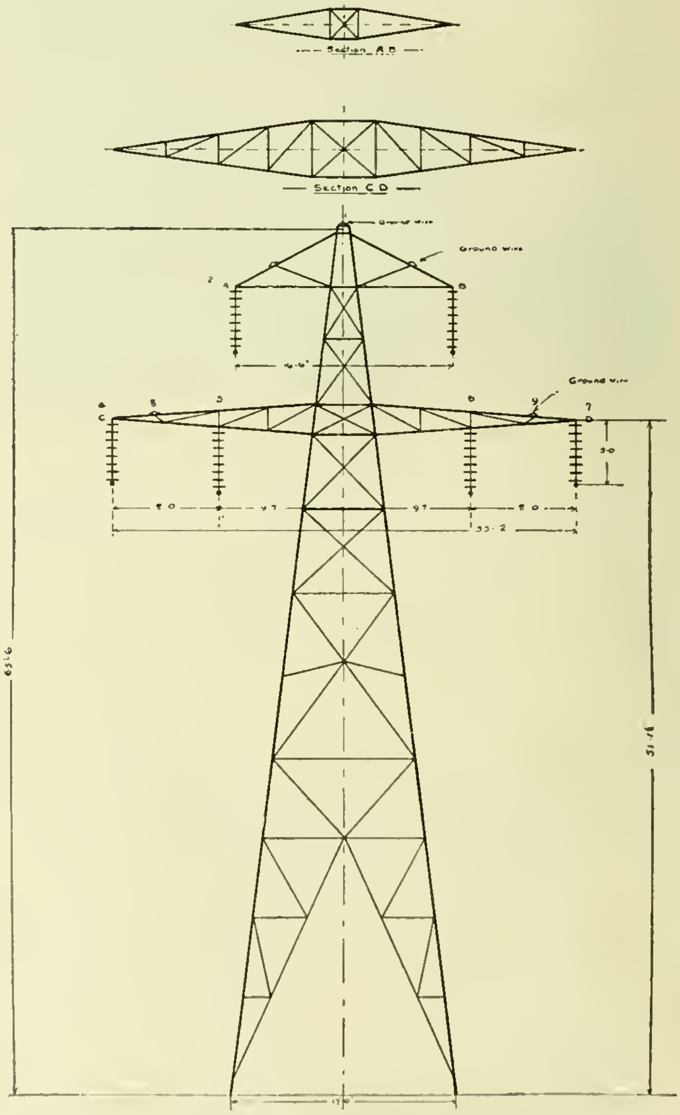


Fig. 8 Showing Tower Dimensions.

tends to open the switch so that any accident to the mechanism will place the switch out of service.

For lightning protection two sets of electrolytic lightning arresters for the 110,000 volt lines are installed, of the outdoor type, the aluminum plates being enclosed in large oil filled boiler iron tanks. The combination horn gap and disconnecting switches are mounted on 110,000 volt insulators, which are in turn mounted on structural steel supports.

The control of the 12,000 volt circuits from the generating station to the low tension side of the transformers, is accomplished by nine type "C" Westinghouse automatic circuit breakers for 12,000 volt operation, these breakers being mounted in brick compartments and so designed that gravity tends to open the switch. Marble control panel, switchboards and fuse panels are also supplied.

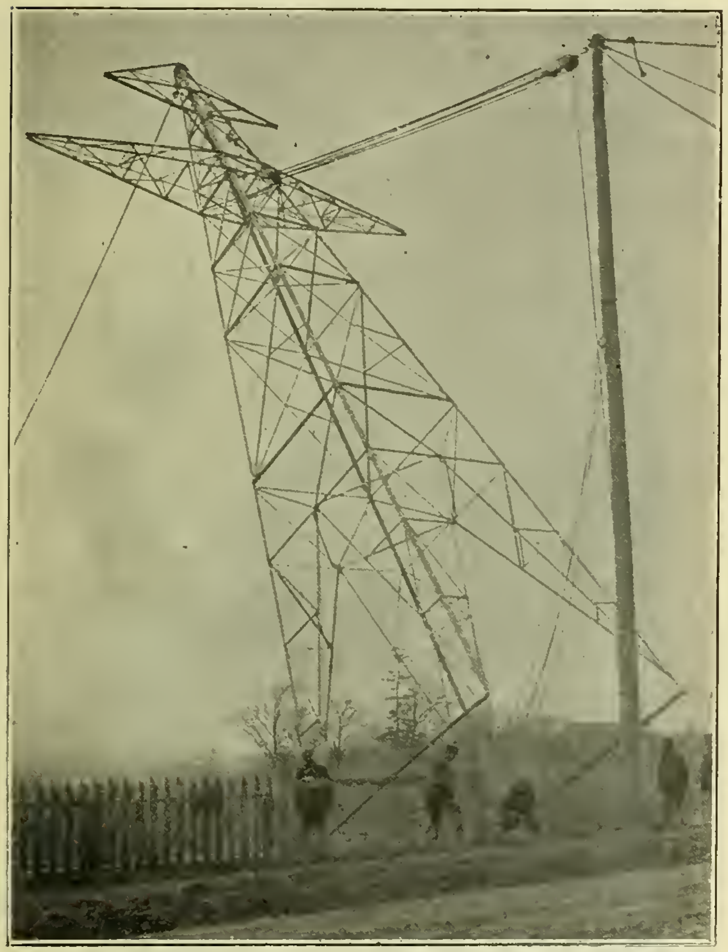


Fig. 9—Tower in Course of Erection.

The construction of the Niagara station is shown in further detail in a number of cuts reproduced herewith. An external rear view is given in figure 5, which shows the hoods that have been erected to protect the lightning arresters and horn gap structures from the weather. These hoods are 8 feet wide and on account of their unusual size and the weight of the structures enclosed are supported on concrete piers extending up from the ground.

The general arrangement of the apparatus is seen in figure 6. The station is built to accommodate four banks of three 3,000 k.v.a. single phase transformers, of which three banks will be installed in the near future. The layout of the building, however, is such that it may be extended to an ultimate capacity of 72,000 kilowatts, which will mean a total installation of eight such banks.

Within the station the 12,000 volt switching apparatus and bus bars are located in the basement, adjacent to the terminal rooms, where the incoming underground cables terminate. The leads from the transformer oil switches pass up through the floor to the transformers, where the potential is stepped up to 63,000 volts. The transformers are connected in Y on the high tension side, which gives a line voltage of 110,000 volts. A fair idea of the size of these transformers is obtained from figure 7.

The high tension switch room extends along one side of the building, and in it are located all the high tension transformer and line switches, disconnecting switches and bus bars. The control apparatus is located on a gallery at one end of the building. This gallery is entirely enclosed, but is well provided with windows to give the operator a view of the high tension room. When the building is extended to its ultimate capacity, the control gallery will be in the middle. All oil switches are electrically operated.

The wiring plan of the Niagara station is shown in diagram in figure 25. The extent of the present installation is shown in heavy type on the left of the figure. The plans for the immediate future are outlined on the right.

The contract for the construction of the Niagara building was filled by John Hayman & Sons. of London. It is of steel, red pressed brick, reinforced concrete and stone. Work was carried on during the winter of 1909-10 and the building completed early in the spring. The cost of the building was about $50,000.

TRANSMISSION

Length of Line, 283 miles—Double Circuit Towers nearly all the way—110,000 volts throughout—All Cable is made of Aluminium.

The trunk line which runs from Niagara Falls to Dundas is built in double circuit No. 0000 B. & S. cable. These cables are all of aluminium and have a tensile strength of 27,000 pounds to the square inch and 61 per cent. conductivity as compared with pure copper. All the high tension long span cable was supplied by the Northern Aluminum Company and manufactured in their own works at Shawinigan Falls, Quebec. The order for the high tension cable had a combined weight of over 1,250,000 pounds. Additional supplies for distribution purposes to the extent of 350,000 pounds have also been awarded to this company. The aluminium is imported in the form of alumina, an oxide of aluminium, and is reduced in the regular way, in electric furnaces and drawn, all at the company's works.

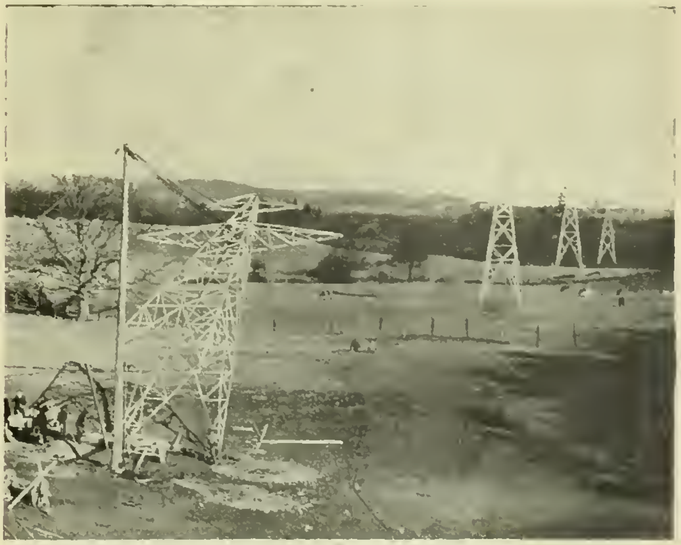


Fig. 10—Row of Erected Towers in Dundas Valley.

The line is carried on steel towers which are placed about 550 feet apart and have an average height of 65.6 feet. All insulators are one piece suspension insulators and have a diameter of about 10½ inches. Eight of these one-piece sections are used for the suspension type insulator, whereas ten sections are used for making up a strain insulator. Strain insulators are used about every 1½ to 2 miles. Special towers have been designed and constructed for long spans, turning angles, and going over rivers and canals. For example, the towers at the Welland Canal which is 420 feet in width, are 140 feet high and are of a quite unusual design, being unlike anything in the way of towers ever used in such work up to the present. These towers are shown in fig. 15. The whole transmission line is protected by an overhead well grounded system which consists of four galvanized steel cables where double circuit lines are carried and two steel cables where a single circuit line is carried. All towers have steel footings except where the soil conditions make it necessary to use concrete. The longest span of the whole system is about 1,100 feet over 16-Mile creek. The minimum distance between conductors is eight feet, which distance is increased, according as the span length is greater than the normal, up to 14 feet.

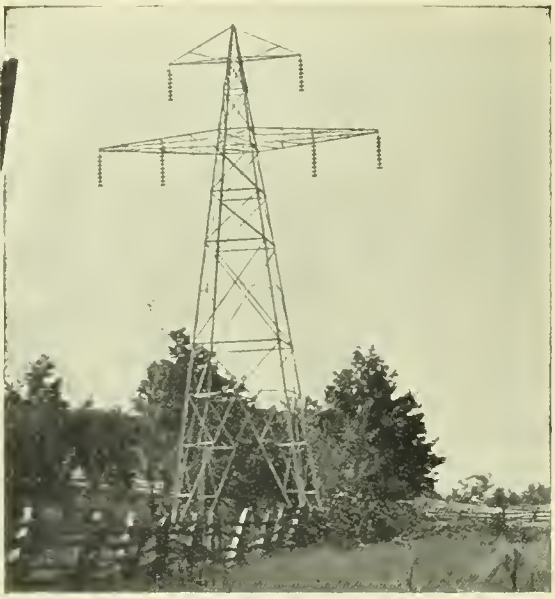


Fig. 11—The First Completed Tower.

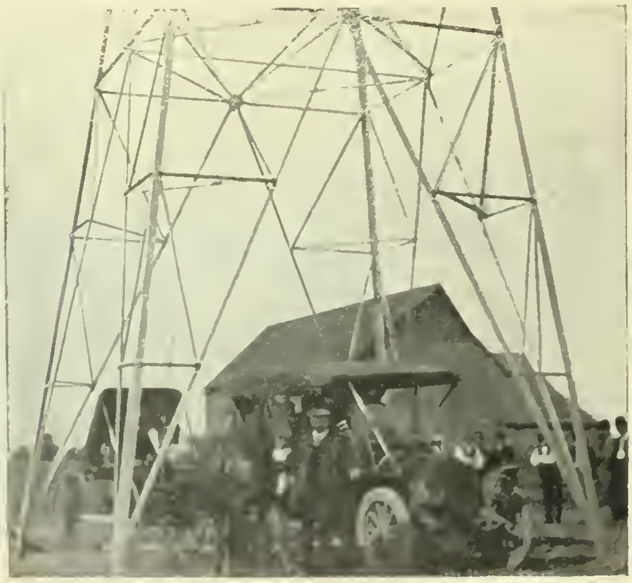


Fig. 12—The bases are 17 ft. square and very roomy.

From Dundas out, east to Toronto and west to St. Thomas, London, Stratford, etc., the cables are No. 000 B & S aluminium. The total length of the line being installed at present is about 283 miles. Throughout this distance the pressure is 110,000 volts. As indicated in the map shown on page 53, there is a double transmission line, consisting of two sets of three cables each, carried by a single row of double circuit towers, from Niagara Falls to Dundas and from Dundas to Toronto. The line from Dundas to Stratford by the upper route and from Dundas to London and St. Thomas by the lower route is a single circuit three cable line as yet but provision has been made for doubling the capacity of this line in that all towers installed on this section are also double circuit towers. From Stratford to London the line is equipped for single circuit only.

The transmission lines, for the most part, and other things being equal, follow a course as the crow flies. In many cases, however, it has been deemed advisable to diverge somewhat from this rule in order to follow along a highway or cross in the vicinity of railway stations or villages—the necessity for this being evident when it is stated that it is the present intention of the Commission that each point of the transmission system shall be patrolled every day. As a general rule, paralleling of steam railroads has been avoided on account of the oil, soot, smoke, etc., which are found there and which, by settling on the insulators, have been shown in a number of cases where transmitting wires have been so placed to greatly reduce their insulating capacity. In one other instance, the main line from Niagara Falls to Dundas, the wires were placed many miles farther south than was at first planned in order to keep clear of an area in which violent electric storms are known to be frequent. This information was gleaned by actual and systematic inquiry among the oldest inhabitants and by studying the records of the telephone and telegraph companies operating in this district. The greatest care was taken to make this investigation complete and it is believed that, as a result, the zone through which the transmission line passes is reasonably safe from extraordinary lightning occurrences.

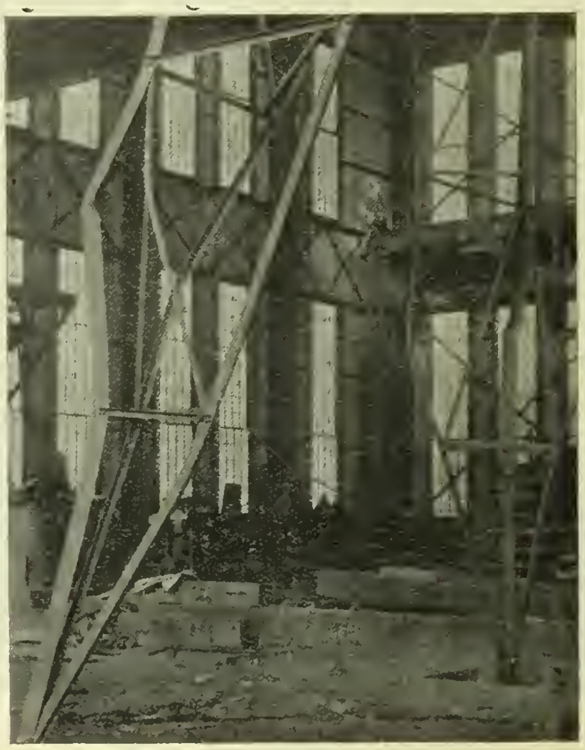


Fig. 13—Collapsed with 20,950 lbs. horizontal pull.

Referring again to the map, page 53, we see that the transmission lines west from Dundas form a complete loop. A projected third line running south through Simcoe, Tilsonburg, etc., will run all the way to St. Thomas and form a second complete loop.

In the near future it is possible that another line will join Guelph through Georgetown and Brampton with Toronto, thus forming a third loop. By this plan of looping it is hoped, in case of accident to the line, to avoid interruptions in the service at any point other than where the accident actually occurs. For example, supposing the transmission line is broken between Berlin and Stratford; this would ordinarily deprive Stratford and St. Mary's of power and light. By the existing arrangement, however, the current through Woodstock can be switched on at London and power supplied to both ends of the broken line from opposite directions.

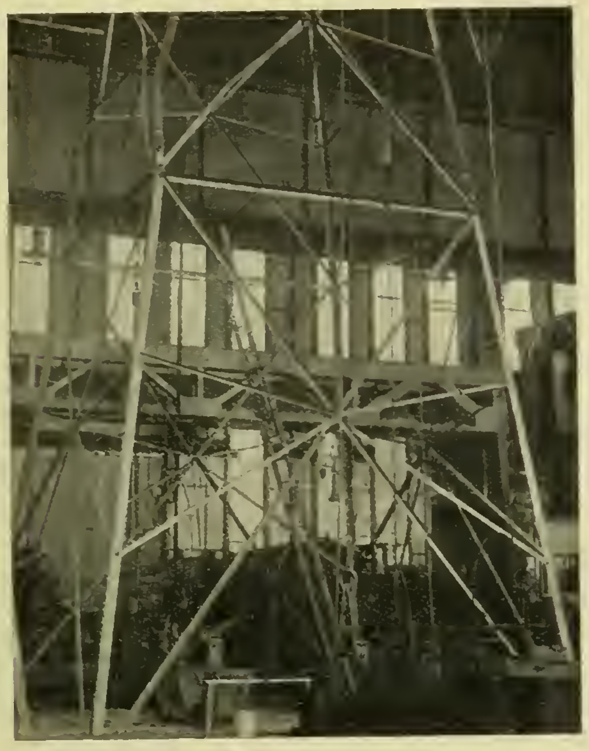


Fig. 14— Collapsed with 14,650 pounds pull.

The Towers

Metal towers are being used throughout. In all, about 3,000 towers will be required for the 283 miles; an average of 10 to the mile, or one every 525 feet, though special conditions cause these distances to vary. Before deciding on the particular type of tower to be used, exhaustive strain tests were made in different directions and at different angles, on two competitive types of tower, one constructed according to the Hydro-Electric Commission's own plans, the other being supplied by a manufacturing establishment that wished to submit tenders for the supply of this part of the material. The bases of the towers having been firmly fixed, varying pulls were exerted from different points on the framework. The Commission's tower withstood, without injury, a horizontal strain up to 20,000 pounds, but at 20,950 pounds was bent over. The other tower on which similar tests were made collapsed under like conditions with a 14,650 pound pull. It will thus be seen that the tower chosen is stronger by over 40 per cent.

The entire contract for the furnishing completely of all towers and footings required on the line was awarded to the Canadian Bridge Company, Walkerville. The footings for the towers were not galvanized but were made of a heavier material on account of not being galvanized, and were given a coating of a special paint designed to withstand the effects of the weather. All parts of the towers above the ground, including bolts, were hot galvanized in a plant which was built especially for the purpose. Special punches for the fabrication of the material were also put in, so that within a short time after starting operations the company was enabled to get out towers so as to ship at a rate of from ten to fifteen complete towers per day. The total order was for 3,094 towers, of which 2,305 standard double circuit towers were all alike. There were 400 single circuit towers, 282 anchor towers and 28 special towers for use in crossing other transmission lines, including two Welland Canal crossing towers; also 36 entrance towers used in carrying the wires into the transformer station. The remaining 43 towers are to be used on the Toronto city line. Of the above towers some 2,800 were placed on standard footings, the remainder being placed on a heavier type of footing embedded about eight feet in the ground with a portion of the towers placed on concrete footings, for which were furnished bent plate connections which were galvanized.

The total tonnage involved in the contract was something over 7,000 tons, of which over 6,000 tons consisted of galvanized material.

The towers are all being labelled with enamel signs warning the public of the danger of approaching them too closely. The total number of signs required was about 3,200, each 16 x 24 inches, blue ground and white lettering. The signs were manufactured by the McClary Manufacturing Company of London.

The dimensions of a standard double circuit tower are shown in fig. 8. The height of a tower is 65 feet 6 inches over all; the upper arm is 16 feet 10 inches, the lower arm 35 feet 2 inches in length. The conducting cables of each circuit are approximately 9 feet apart. A complete insulator is 5 feet 2 inches in length. The tower base is square, 17 feet to a side. The tower footing is sunk 7 feet 6 inches in the ground. No concrete is used except in rare cases, such as soggy ground or hillsides. The bottom 6 inches of the hole is filled with fair sized stones; then a 22 by 34 inch iron grate placed horizontally is bolted to the iron foot; earth is filled in to within 18 inches of the surface, where more stones are used.

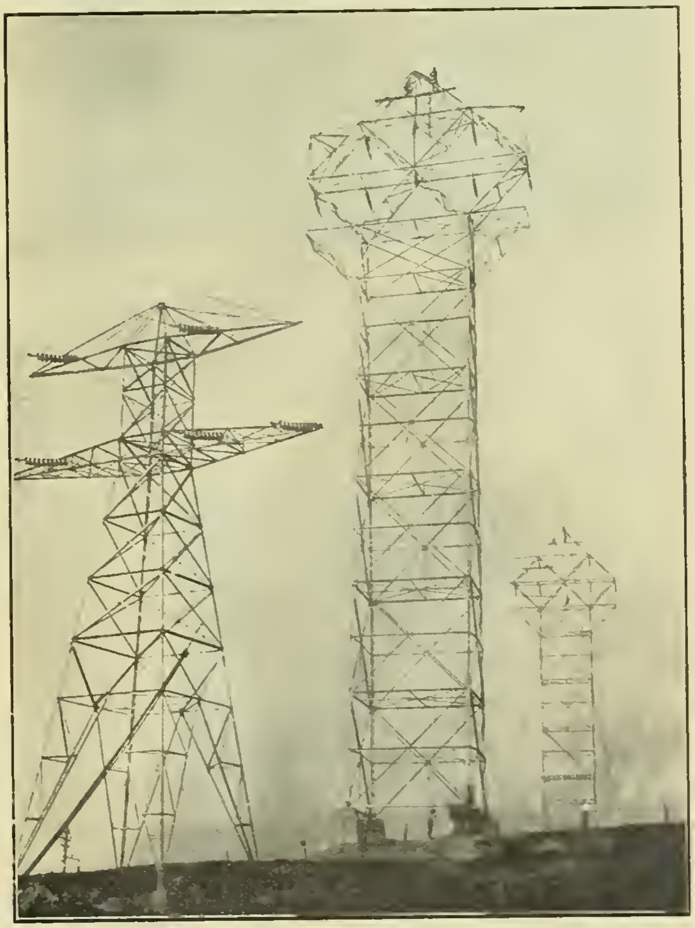


Fig. 15.—Special Towers over Welland Canal—Strain Tower in the foreground.

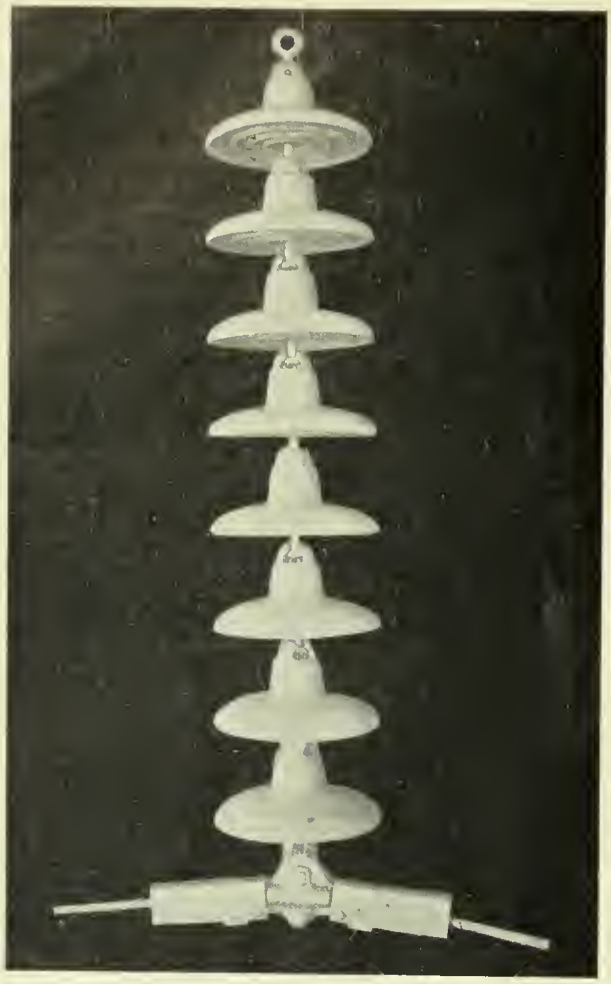


Fig. 16—110,000 Volt Suspension Insulator Provided with Cable Clamps and Guards.

The weight of the standard towers is 3,995 pounds. Towers were shipped in sections about 22 feet long, and each was assembled lying on its side close to the footing excavations. They were erected by block and tackle arrangement, one team of horses being sufficient. To erect a completed tower required from 10 to 12 minutes only.

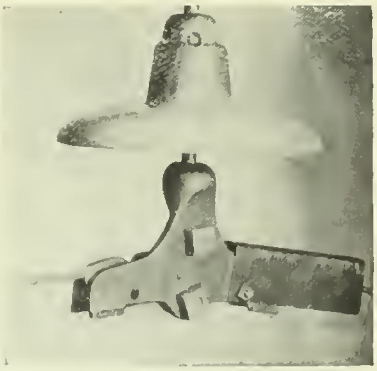


Fig. 17 Protecting Hood, one side removed.

Figure 9 shows a near view of one of the double circuit towers in process of erection. Figure 10 is a row of erected towers along the Dundas valley. Figure 11 is a reproduction of a completely equipped tower on the Niagara-Dundas line—the first erected. Figure 12 shows the roominess of the base of the towers, where a space 17 feet square is large enough to allow an automobile and a horse and carriage to stand side by side. Figures 13 and 14 show the two towers undergoing tests in the shops of the Canadian Bridge Company, Walkerville, Ontario. The first is the tower ultimately chosen by the Commission, which withstood a horizontal strain of 20,950 pounds. The other is a tower submitted by a contractor, to the Commission for test purposes, and which collapsed with a 14,650 pound pull. Figure 15 shows the type of tower used at the Welland Canal crossing. In the foreground is an ordinary strain tower. The other towers stand one on each side of the canal. They allow a water clearance of 150 feet.

High Tension Insulators

A large number of various types of insulators were submitted for comparative tests. It was necessary to take into account the fact that although the line was nominally carrying a 110,000 volt current, yet abnormal conditions may set up surges on such a long line sufficient to raise the voltage momentarily well up to 200,000. For this reason severe tests were made under both wet and dry conditions, with voltages up to 400,000.

The insulation tests were made on the premises of the Ontario Power Company, who placed all apparatus and machinery used in making the tests at the disposal of the Commission, furnished all the power free, and in many other ways greatly assisted the work of the Commission's engineers. The specifications for the high tension insulators called substantially for an insulator to withstand a potential of 330,000 volts (i.e., three times normal) when dry and of 220,000 (twice normal) under a rainfall of a half-inch of water per minute combined with a wind strong enough to direct the flow of the rain at an angle of 45 degrees.

Strain tests were also made to determine the mechanical strength of the various types. Mechanically, the suspension insulator, i.e., the insulator from which the cable is suspended, was required to withstand a pull of 8,000 pounds without injury to any of its parts. The strain insulator, i.e., the insulator used to take up the horizontal strain of the cable, was required to withstand a pull of 10,000 pounds.

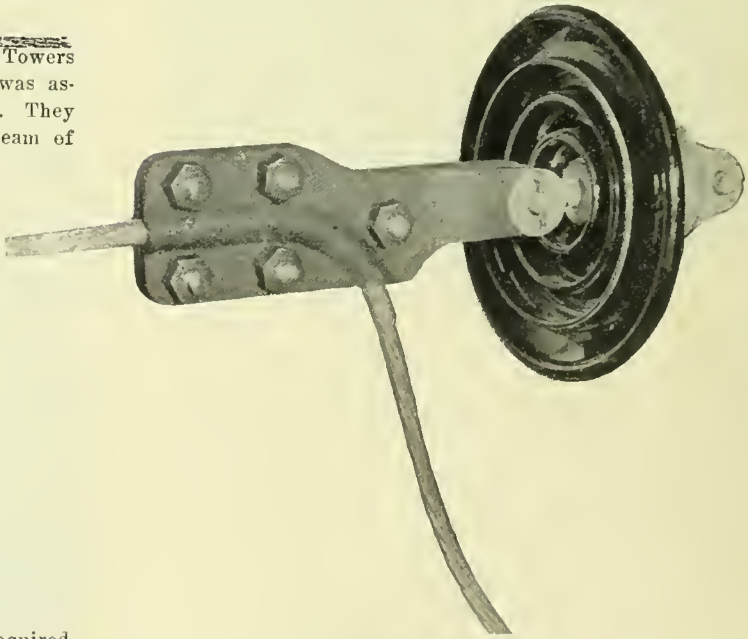


Fig. 18—Strain Cable Clamp.

After these severe tests, which occupied the time of two engineers for the greater part of two months, the insulator submitted by the Ohio Brass Company was, with a few changes, chosen for both suspension and strain type, eight sections being used for the suspension type and ten sections for the strain type. A photograph of the suspension insulator as used is reproduced in fig. 16. Though the requirements are only for 110,000 volts the insulators are suitable for a 150,000 working voltage should the Commission decide to raise their transmission pressure to that amount. Recent tests made by Engineer Sothman over the completed line into five substations held 200,000 volts for three minutes without any sign of discharge.

The insulator may be described as a one piece, eight unit, suspension type insulator. Its total length is 5 feet 2 inches the width of each unit 10½ inches. It will be noticed that there are no sharp corners about the pattern from which discharges may easily leak off; also the different sections are connected by a ball and socket arrangement allowing freedom of movement. When this insulator is in position on the tower its lowest point is 46 feet from the ground.

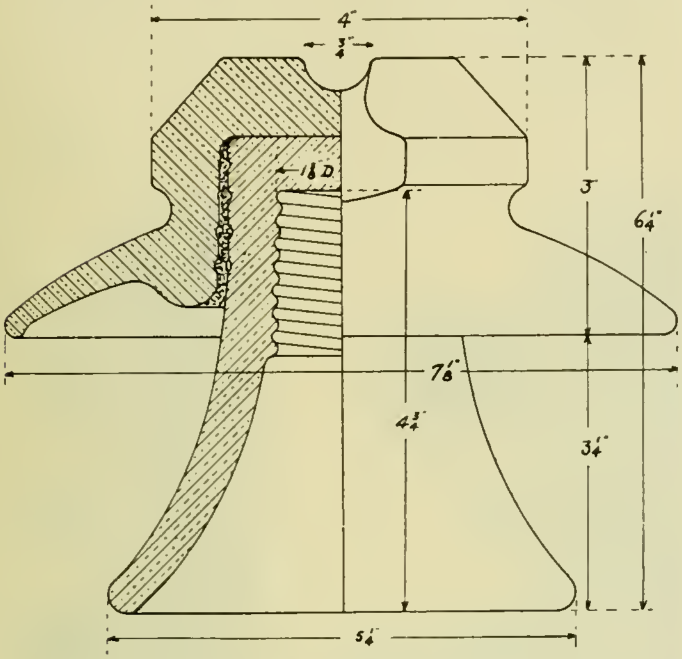


Fig. 19—13,200 Volt Insulator Dimensions.

As a precautionary measure the cables just below the insulator are all protected by a special hood arrangement. Where the transmitting wire is clamped to the insulator there is always the possibility of a discharge from the latter to the wire, which in time might injure the cable at that point by burning it. To overcome this danger a protecting hood is attached throughout the whole line, as shown in fig. 17, which bears the brunt of the discharge and so protects the cable. The sketch shows one-half of the hood removed; the complete guard is seen in fig. 16. Fig. 18 shows the type of clamp used in connection with the strain insulators.

Low Tension Insulators

The low tension insulators for use on the 13,200 volt distributing lines were supplied by the R. Thomas & Sons Company, of East Liverpool, Ohio. The order amounted to approximately 30,000 units. Figure 19 indicates the dimensions of the insulator. It consists, as will be seen, of two parts, the parts being cemented together neatly with Portland cement, the pin or lower part being threaded for standard 1 3-8-inch pin. These insulators are glazed with a slate color to conform as nearly as possible with the color of the galvanized tops. The insulators were all tested at the factory for 75,000 volts before shipment and inspected by the inspector of the Hydro-Electric Power Commission.

Broken or Short Circuited Wires are Dead

In addition to the ordinary series relays installed in every substation the Commission's engineers have safeguarded the lives of the people it serves by a differential relay system which operates under either increased or diminished load to automatically cut out the section affected and render the wires dead.

The accompanying diagram, fig. 20, indicates in a general way the plan that is being followed to render a transmission wire harmless if it should break at any point between stations and the loose ends should fall to the ground. The drawing represents two consecutive stations, as it may be St. Mary's and London, connected by three high tension trausmission cables. Running parallel with these cables on a separate pole line (in actual fact the telephone poles are used) are three smaller wires, each of which is supplied with a weak current by small capacity transformers, one at either station, these being fed by one or other of the three main transmission cables, as shown. Each of these small circuits operates, at either station, one pole of a three pole relay used to close a short, strong, local battery circuit. In case of accident to one of the main lines, which will produce a marked change in the strength of the current through the small-capacity transformers on that particular line, a large momentary current is induced in the corresponding relay line which operates the relay at both ends and closes the two local battery circuits; these, in turn, excite powerful electro-magnets which open the main line oil switches at the two terminal stations. The relay lines, as will be seen, are star connected at each station and earthed.

It will be seen further, that this scheme of installation is a

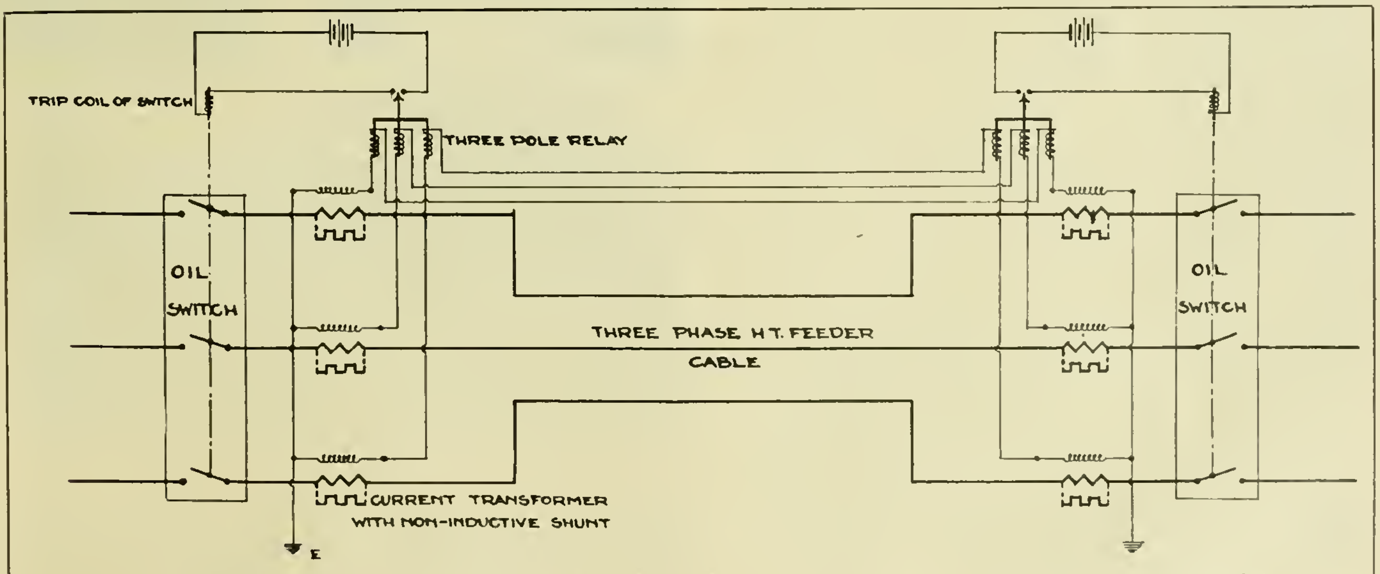

TRIP COIL OF SWITCH
THREE POLE RELAY
OIL SWITCH
OIL SWITCH
THREE PHASE H.T. FEEDER CABLE
CURRENT TRANSFORMER WITH NON-INDUCTIVE SHUNT
E

Fig. 20—Relay System of rendering a broken or Short Circuited High Tension Transmission Wire harmless.

safeguard not only against breakages in the transmission cables, but also equally against short circuits. If two wires should by chance become crossed or otherwise short-circuited the result would be a sudden increase in current strength which would produce a corresponding instantaneous increase in the relay, so that the local circuits and the electro-magnets would operate as before.

As all stations in this system, with the exception of one, are on loops, it is easily seen that, should any line become defective, all stations will still be furnished with a source of power from the other side of the loop. For example, should trouble occur in a line between Dundas and Guelph, all the transformer stations beyond Guelph, such as Preston, Berlin, etc., will be furnished with power by means of the line running through Woodstock, London and St. Mary's.

TELEPHONE

Constructed on Separate Line—Patrol-man can speak from any point—Special precautions against Induction effects.

To facilitate maintaining the service, and to reduce the loss of time in getting disabled machinery and lines back into operative condition, the Hydro-Electric Commission have installed an extensive private telephone system connecting their many substations throughout the province with the central points of distribution. For this purpose a separate pole line has been installed paralleling the high tension system throughout and at most points quite close to it. The patrol men will be provided with portable telephone sets having an attachment whereby they can cut into the line at any point and communicate with the substations.

This system, because of the large area it covers, is of the magneto type; the two principal or central exchanges being located at Dundas and London. The switchboards at these two stations are designed to be placed on a desk or table and are arranged to occupy the least amount of space possible. The apparatus in the cabinet is compactly mounted and is readily accessible for examination or repair. The equipment of each board consists of ten lines with wiring for twenty. The line signals are of the mechanical restoring self-contained drop type mounted as a unit, with its associated jack, which is equipped with double cut-off springs provided with pure platinum contact points. The drop is wound to a resistance of 500 ohms. Four pairs of cord equipments are provided with provision for an ultimate equipment of six. These cord pairs are further provided with a permanently bridged 500 ohm clearing-out drop of a type similar to the line drop. The operator's set is of the standard suspended transmitter type with head receiver attached to connecting cord and plug.

The ringing current for the telephones is obtained from a transformer at 110 volts and a frequency of 25 cycles. In cases of emergency, however, the hand generator with which these boards are supplied can be used for signalling, the switchboard being provided with a generator-switch so that either hand or power generator ringing current may be readily connected to the circuit. To eliminate all possibility of failure of the telephone equipment and to prevent disturbances in transmission due to damaged wiring or cable, the connections between the switchboard and the protector equipment are made with lead covered cable having cotton and silk insulated wires.

The switchboard equipment of the substations located at Niagara Falls, Guelph, Berlin, St. Marys, Toronto, Preston, Stratford and Woodstock are of the self-contained wall type, similar to that shown by figures 21 and 22. These boards are equipped with five lines and two connecting cords with associated apparatus and are of the same type as installed in the two larger switchboards located at Dundas and London. Provision is made for an ultimate equipment of 15 lines.

With telephone equipment to be used in connection with power stations, special precautions must be taken to protect the apparatus from induced static charges on the lines and the possibility of connecting with the high tension wiring of the station. With the exceptionally high pressure of 110,000 volts, which is employed by the Hydro-Electric Commission between its stations, it was imperative that the telephone equipment be positively protected against injury from stray currents, static charges or lightning. Also the fact that many of the telephone lines parallel the transmission line, made it necessary to provide special means for obtaining quiet telephonic transmission and for grounding the high voltage static charges.

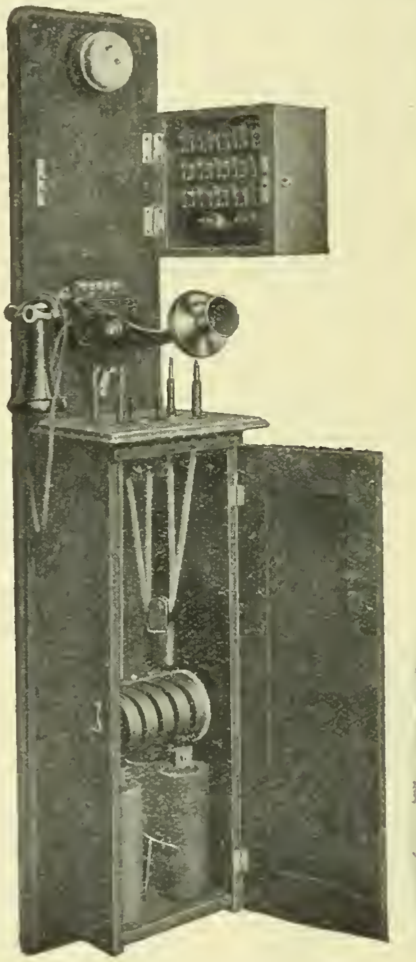


Fig. 21—Open.

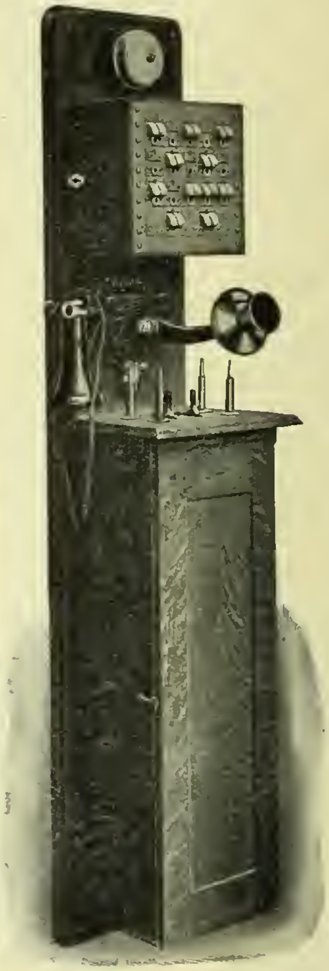


Fig. 22—Closed.

To "bleed" the telephone line of such charges and still not interfere with the transmission of the voice current or decrease the efficiency of the signals between stations, it was necessary to design special impedance coils. These impedances are made up on the principle of a core type transformer, the core consisting of a closed circuit of thoroughly annealed iron wires on which are wound two coils of pure copper wire having a low ohmic resistance and which are connected in series. A neutral top for grounding is brought out from the middle point of the two impedances. The whole coil is enclosed in a cast iron case mounted on a suitable back board. These impedances are bridged directly across the line, the coils being so connected that an alternating current produced either by the generator for signalling purposes or the transmitter, and using both line wires for the circuit, is prevented from being shunted by the coil owing to the fact that the current passing through the coils from one side of the line to the other sets up a countermagnetic force which in turn produces a high impedance in the circuit and allows but a small amount of current to flow between the two line wires. A static current, however, induced by the high tension lines being always in phase in each line wire, that is, the oscillations of the charge on each wire coincide, hence, when this static current flows through the coils the magneto motive force induced by each coil is in the opposite direction, which neutralizes the magnetic effect of the core and, therefore, reduces the impedance to static charges to practically nothing. It will be readily seen that by this arrangement the induced current is harmlessly dissipated while the transmission and ringing currents are not decreased. As an additional protection to the apparatus in the switchboard through stray currents and lightning charges, a double pole, double throw switch and double fuse and carbon block lightning arrester are connected with those lines paralleling the high tension circuits.

To aid the linemen in reporting to the stations any damage to the transmission system which they may discover on their rounds, they are provided with magnetic test sets especially designed for operating with telephone lines used in connection with high tension transmission. The principal feature of this set is the use of a low capacity condenser in the receiver circuit which eliminates the use of a hook switch and allows the calling of the instrument at any time when connected to the line. A push button key is furnished in the transmitter circuit of the microphone permitting the battery to be cut off when desired. A 5-bar hand generator and 1,000 ohm ringer is provided for signalling purposes. A special impedance coil and grounding plug is supplied for protection against static charges.

To enable the linemen to make connection with the telephone circuit a collapsible pole of four 5-foot sections is furnished. This pole is provided with hooks held in contact with the wires by spring tension, thus assuring a positive connection.

The above described system completely installed, and equipped with switchboards and auxiliary apparatus. consisting of special impedance coils, lightning arresters, cable and test sets was supplied through Mr. George J. Beattie, of Toronto, Canadian representative of the Stromberg-Carlson Telephone Manufacturing Company, of Rochester.

DUNDAS

The Hub of the whole System—Apparatus Complete by Canadian Westinghouse—Double Set of Busbars—Hamilton City Served

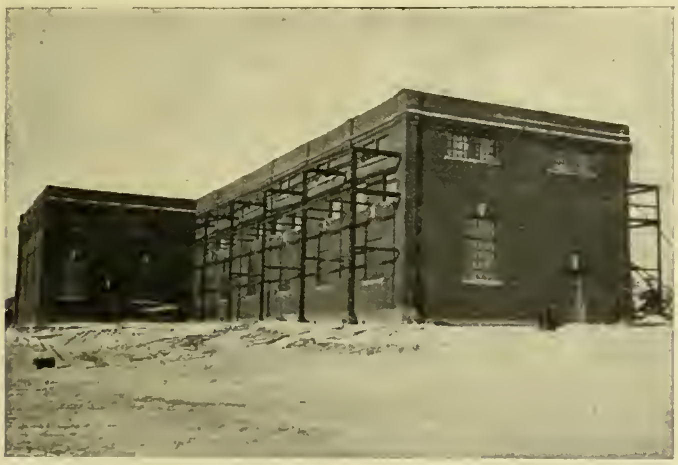


Fig. 23—Exterior View Dundas Interswitching Station

Dundas may be looked upon as the hub of the system, as it is from here that all lines radiate to the towns and cities east and west. The current arriving from Niagara passes through lightning arresters, disconnecting switches, and oil circuit breakers to the bus bars. Two sets of bus bars are installed and connections aro so arranged that it is possible to connect each line, either incoming or outgoing to either or both busses. The wiring plan is shown in figure 26. It will be seen that the station is divided into two parts, (1) the interswitching station, where the 110,000 volt current is sent out in three directions, east to Toronto, by a double circuit tower line; northwest by west, to Guelph, Preston, Berlin, Waterloo, Stratford, St. Marys, etc., by a single circuit line, and southwest by west, to Woodstock, London, St. Thomas, etc., also by a single circuit line, and (2) a stepdown station where a supply is transformed from 110,000 volts down to 13,200 volts for local service and for transmission to Hamilton, six miles distant.

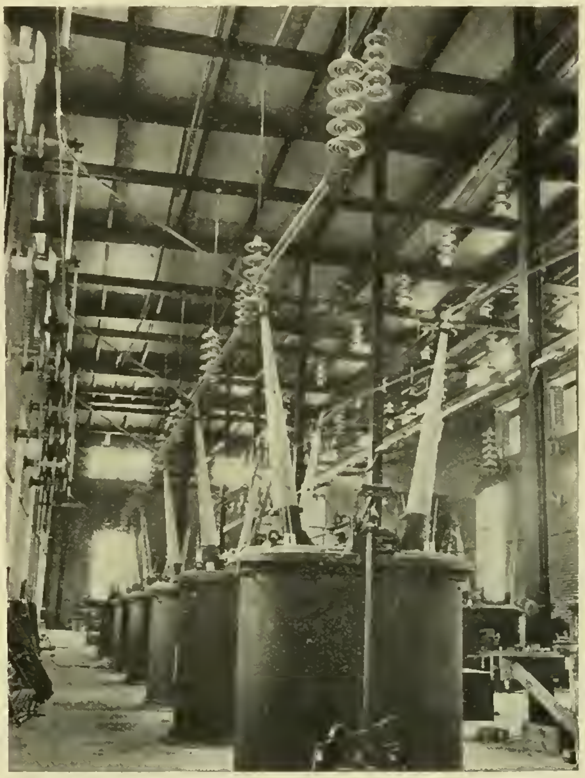


Fig. 24 High Tension Switch Room in Dundas Station.

The electrical equipment for Dundas was supplied in full by the Canadian Westinghouse Company and is as follows: Four 750 k.v.a. oil insulated water cooled Westinghouse step-down transformers, 110,000 to 13,200 volts, for supplying the city of Hamilton and vicinity; six type "GA" 110,000 volt Westinghouse electrically operated circuit breakers equipped with condenser type bushings; six sets of outdoor type 110,000 volt electrolytic lightning arresters; two sets 13,200 volt electrolytic lightning arresters; two switchboards, control panels, etc.

This distributing station enjoys the distinction of controlling the largest number of 110,000 volt circuits of any station in the world and for simplicity and symmetry, we believe, is unequalled in any station so far built, for the control of such a large amount of energy at 110,000 volts. A good reproduction of the high tension circuit breakers and connections is given on page 48. This shows the neat arrangement of the oil switches and connections. By an ingenious arrangement when one of these automatic oil switches is thrown open due to a short circuit on the line, a green light shows on the switchboard in the room to the left of the illustration. The switchboard operator can then readjust the switches immediately so that there is no interruption to the service. As soon as the line is righted a red light is shown on the switchboard. The switchboard operator by this arrangement controls the whole system on a board four feet square.

The type of circuit breakers shown in this figure is the same as is used in all tho substations of the Hydro-Electric system,

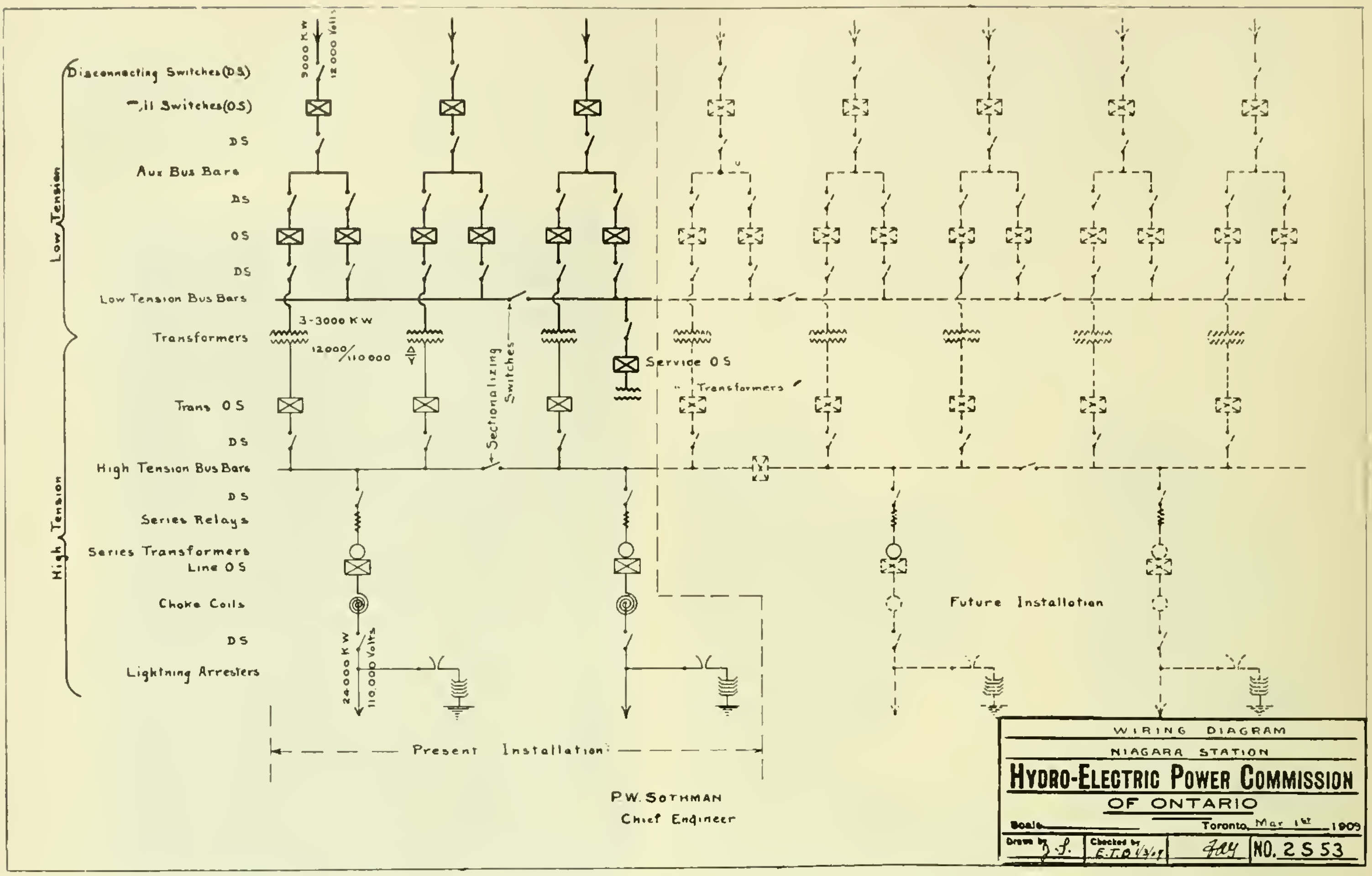


Fig. 25—Wiring Diagram of Niagara Falls Station.

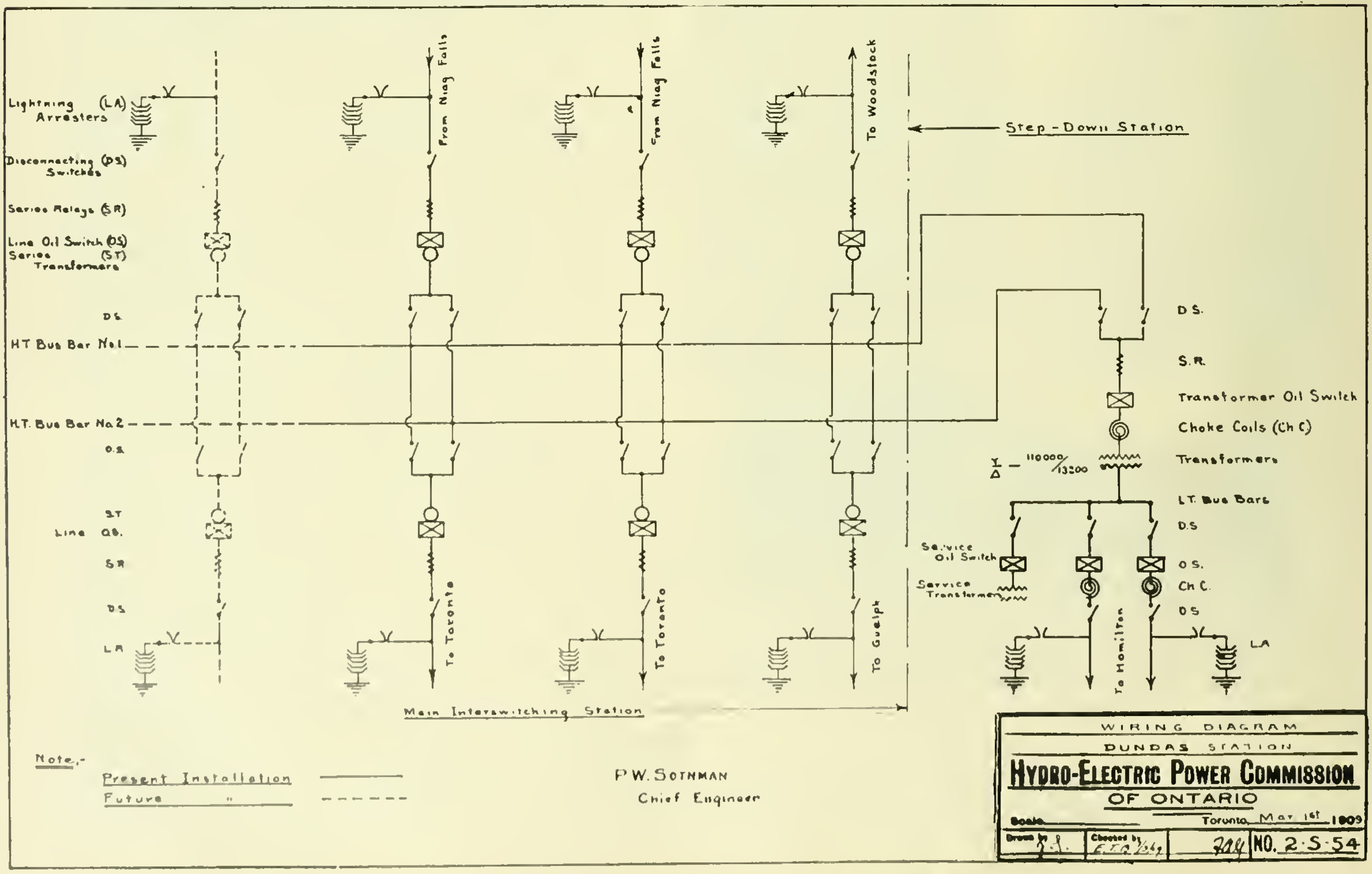


Fig. 26—Wiring Diagram of Dundas Interswitching Station

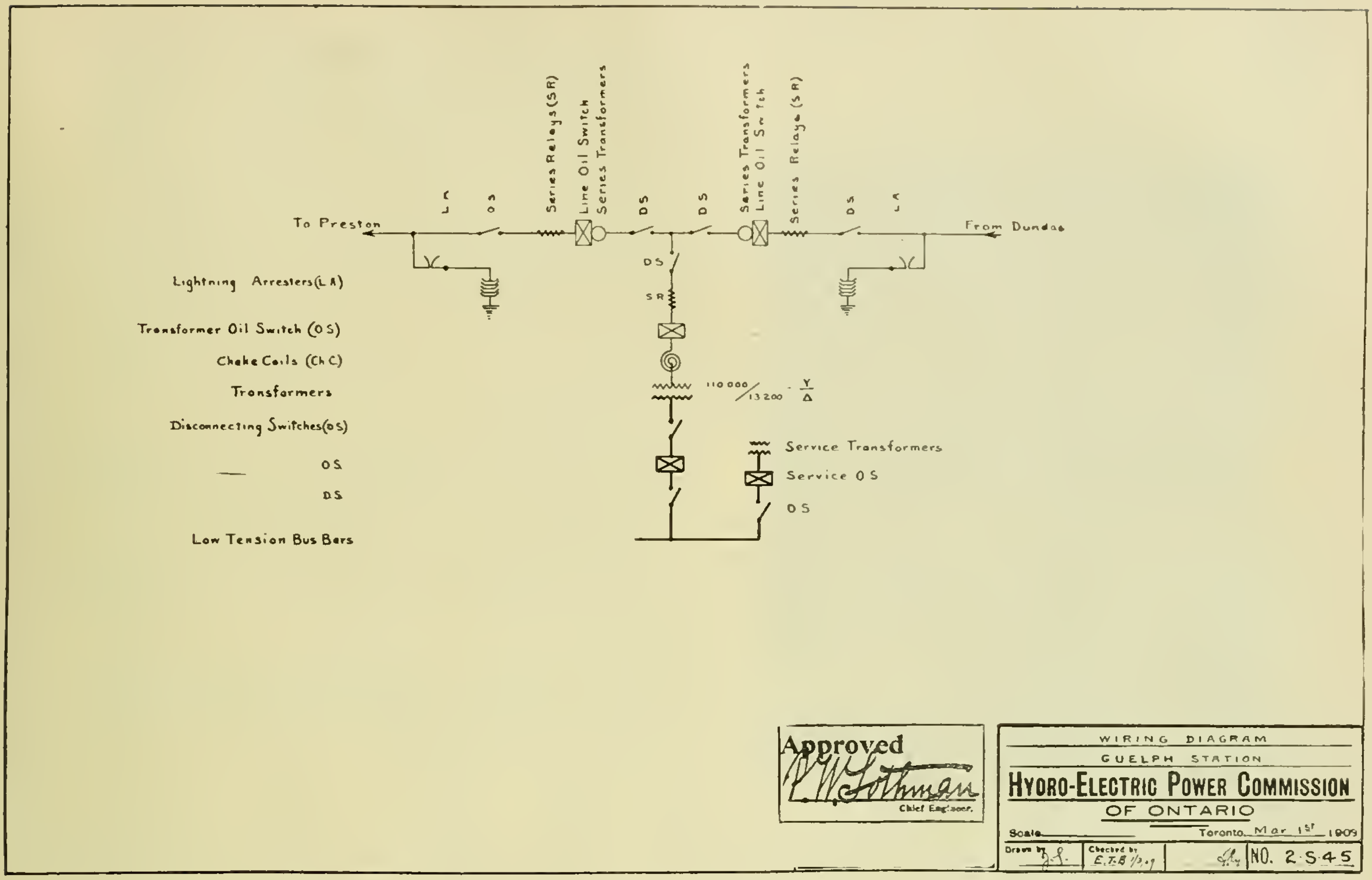


Fig. 27—Wiring Diagram, Guelph Sub-station.

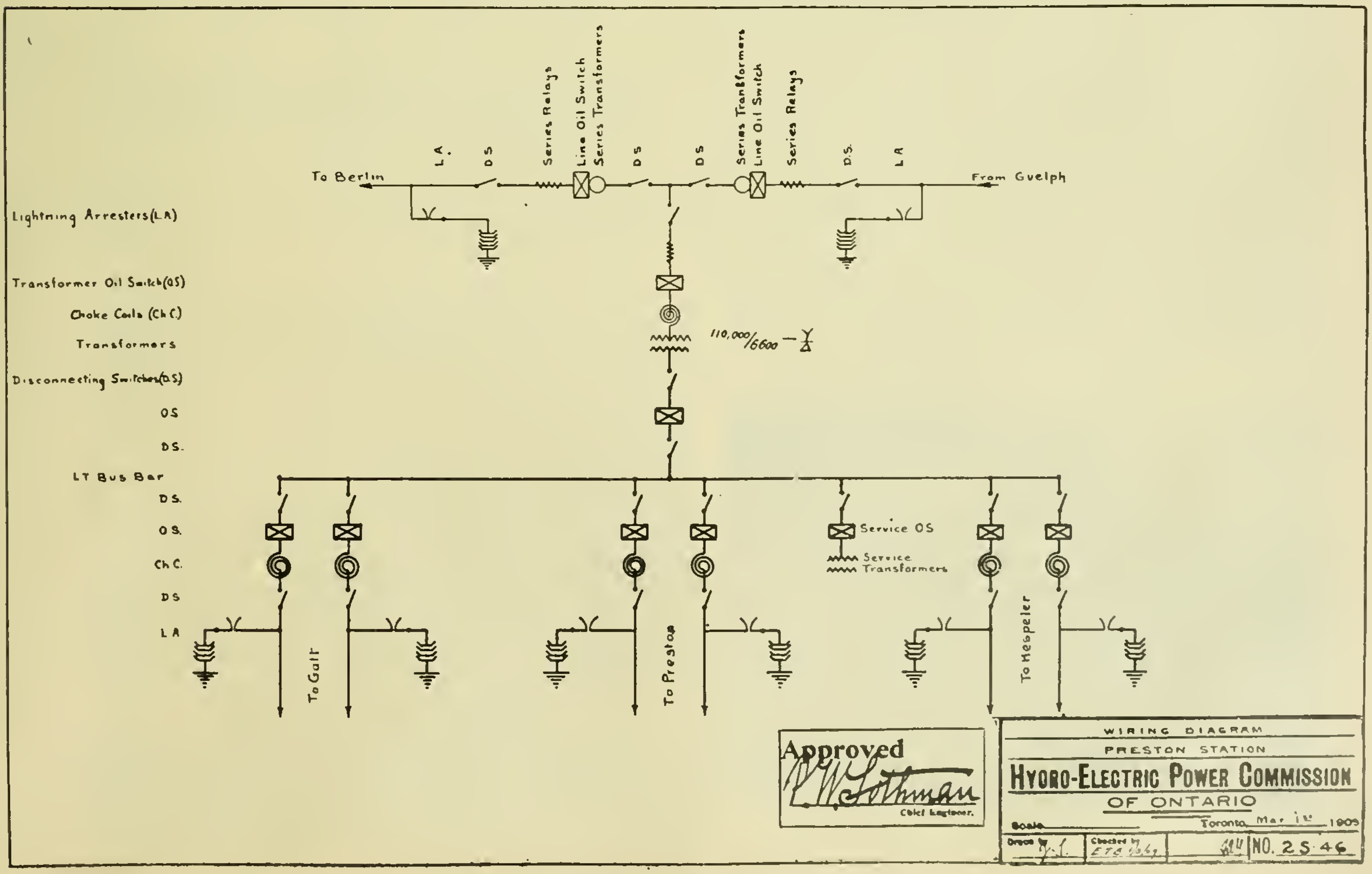


Fig. 28—Wiring Diagram, Preston Sub-station.

which were all supplied by the Canadian Westinghouse Company. Another view is shown in figure 24. An exterior view of the substation nearing completion is given in figure 23.

Hamilton takes 1,000 h.p.

The corporation of Hamilton will use the 1,000 h.p. contracted for, all for its own use. The power will be utilized at the waterworks pumping plant and at the east end sewage disposal. A. F. Macallum, city engineer, is in charge, with John McLaren, Mayor. Current is received direct from Dundas at 13,200 volts, and transformed at the Beach pumping station, where it is stepped down to 2,200 volts. Two transformers are being erected in this station.

GUELPH

Equipment for 2,250 k.w. Capacity—City Distributing System Cleverly Designed — 60 Cycles for Lighting.

Leaving Dundas, the current is carried by a single circuit, 3 wire line, mounted, however, on double circuit towers, direct to Guelph. The cables are of aluminum, No. 000 in size. Current enters and leaves the Guelph substation through electrolytic lightning arresters, disconnecting switches, series relays and high tension oil switches. The current, which is led off the main conductor for the Guelph supply, passes again through disconnecting switches, high tension oil switches and choke coils before reaching the transformers, where it is stepped down to 13,200 volts. From here it passes through disconnecting switches and oil switches to the low tension bus bars, from which the supply for the station service transformers as well as for the city of Guelph is taken. The diagram of the Guelph substation wiring arrangements is shown in figure 27.

The two 110,000 volt circuit breakers for controlling the incoming and outgoing high tension lines are Westinghouse manufacture. These switches are hand operated. The stepdown transformers and other electrical apparatus was supplied by the Canadian General Electric Company. This apparatus comprises high and low tension electrolytic lightning arresters with horn gaps and operating mechanisms; high tension bus and connection work including disconnecting switches, choke coils, and all insulating supports; also high tension transformer oil switches, low tension oil switches, with busses and connections, switchboard and all auxiliary wiring and apparatus for the low tension side of the stations. The station equipment for Guelph is arranged for 2,250 k.w. capacity. These ratings are for normal and do not take into consideration the overload possibilities of the apparatus. There are four transformers of 750 k.w. capacity each, one to be used as a spare. A view of the Canadian General Electric disconnecting switches is shown in figure 29.

Guelph City Distribution

The distribution is divided into two separate sections, lighting and power. For lighting purposes the transformers are located right in the Commission's substation. Canadian General Electric, 3 phase, 13,200/2,200 transformers are being installed.

The lighting system will be operated at 60 cycles, for which purpose two motor generator sets, also in the Commission's substation, are installed, this plan being chosen not so much on account of apparatus already in use throughout the city as from power factor considerations and improved regulation. Each motor generator set consists of a 600 k.v.a., self starting, synchronous motor, an interesting feature of which is that it starts as a slippering induction motor, a 300 k.v.a., 62½ cycles, generator and a 200 k.w. railway generator. The motor generator sets complete are being supplied by the Lancashire Dynamo & Motor Company. The town will be lighted exclusively by tungsten lamps.

The power system consists of two 13,200 volt feeders connecting the Commission's station and the city, and four small distributing stations. One of these stations is larger than the rest and stands in much the same relation to the other three that the main Dundas interswitching station does to the various towns it serves. The two feed lines enter this larger substation on to what is practically two main bus bars. From these bus bars part of the current passes direct through 13,200/575 volt transformers for power distribution in the immediate vicinity, while from the same bus bars three outgoing 13,200 lines supply the remaining small substations at more distant points of the city. The four transformer houses are all built of concrete and will contain, each, two 225 k.v.a., 13,200/575 volts, 3 phase, 25 cycles, transformers. From the secondaries of these transformers power is led off to the various factories. The small transformers are also being supplied by the Canadian General Electric Company.

The installation of equipment is well under way. A feature of the plan on which the system will be operated is the decision on the part of the city to supply their power customers with motors as well as current. For this purpose small motors to the extent of some 1,500 h.p. capacity have been purchased, contracts have been signed with many of their customers, and motors and all complementary work are being already installed so that right from the start Guelph will have a considerable power load.

The management of the distribution has been in the hands of a Board of Light and Heat Commissioners composed of Messrs. Samuel Carter, chairman, Slemin and Mayor Hastings. The secretary of the Board is Mr. J. J. Heeg, who is also superintendent of the electric plant.

PRESTON

Wiring Plan Similar to Guelph—Galt and Hespeler Supplied—Packard Electric Co. Supplying Service Transformers.

Leaving the Guelph substation the high tension line next passes to Preston. The arrangements for the leading in and out of the main current are the same here as at Guelph. The conductors carrying the supply for this district, after leaving the main line, pass through oil switches and choke coils before reaching the transformers where the pressure is reduced, this time to 6,600 volts. Passing out of the transformer the current is again led through disconnecting switches and oil switches on to the low tension bus bars.

From the low tension busses lines are led out of this station to Preston, for local distribution, and to Galt and Hespeler, each about three miles distant, though in opposite directions. The current is first passed through disconnecting switches, oil switches and choke coils in each case. The wiring diagram of this station is seen in figure 28.

The equipment is exactly the same as that supplied in Guelph and just described. The two 110,000 volt circuit breakers for the incoming and outgoing current are the same type, the hand operated "GA" Westinghouse. The remainder of the equipment, transformers, lightning arresters, oil switches, etc., also designed for 2,250 k.w. capacity and supplied by the Canadian General Electric Company, correspond with the Guelph equipment with the exception that the transformers step the voltage down to 6,600 instead of 13,200, as in all the other substations. There are four 750 k.w. capacity transformers—one to be used as a spare.

Local Distribution in Preston

The town is installing one bank of three 150 k.w. Westinghouse transformers and changing the present 60 cycles municipal system over to 25 cycles. The present street lighting arc system will be discarded and tungstens installed throughout.

Galt's Local Distribution System

The town of Galt is supplied from the Commission's transforming station at Preston by a double pole line at 6,600 volts. Part of the power is to be distributed to manufacturers direct at this voltage, this being for the larger power users, but the city will also supply power through its own transformers at 2,200 volts and will distribute for commercial and house lighting at this pressure. The street lighting equipment will consist of 400-6.6 ampere, 60 c.p. tungsten lamps in connection with which three 200 lamp constant current transformers are being installed.

The main transformers consist of three 150 k.w. units, 6,600/2,200 volts.

For a substation the town is adapting the old Board of Works building east of the Town Hall.

The poles and wires of the Galt Gas Light Company, which the town purchased recently for $16,500, are being utilized for distribution. The service transformers, however, are being renewed in order to use the 25 cycle Niagara current.

Galt was delayed in starting work on their distribution system, but since the way has been cleared, great progress has been made. All of the electrical apparatus for station and lines has been ordered and part delivered so that the work of construction and installation is now being rushed to completion.

The three 150 k.w. 6,600/2,200 volts step down transformers for the local substation are being installed by the Packard Electric Company, of St. Catharines. The same company is also supplying all the pole type transformers for distributing light and power through the town.

The prosecution of the scheme has been in the hands of the Fire and Light Committee, of which Reeve F. Stewart Scott is chairman and Mayor Thomas E. McLellan is member ex-officio. The superintendent in charge is Mr. Robert Elliott. Mr. P. B. Yates, of the Hydro-Electric Commission's staff, has acted largely as consulting engineer.

BERLIN

First to use Niagara Power—Distributing System Described—New Hamburg takes 250 h.p.—Waterloo also supplied.

To Berlin belongs the honor of being the first to use the Niagara power, the current having been officially turned on on Tuesday, October 11. On that occasion Chief Engineer Sothman expressed himself as entirely satisfied with the operation of the system.

The wiring diagram for the Berlin substation, figure 34, is almost identical with that for Preston, just described, with the exception, however, that current is transformed down to 13,200 instead of 6,600. Like Preston, there are three lines leading off the low tension bus bars, one to Berlin locally and one each to Waterloo, about two miles, and New Hamburg, about twelve miles distant. The interior equipment corresponds completely with the Guelph installation already described in full. As in both Guelph and Preston the 110,000 volt, incoming and outgoing circuit breakers are Westinghouse manufacture. All the other electrical equipment, transformers, high and low tension electrolytic lightning arresters with accessories, high and low tension busses with disconnecting switches, choke coils and all insulating supports, etc., were supplied by the Canadian General Electric Company. All equipment in this station is also designed for 2,250 k.w. capacity, normal rating. The transformers consist of four 750 k.w. units, one being a spare.

Figure 29 is a view of one corner in this station. Here is shown the mounting of 110,000 volt choke coils, and the connections between them and the 110,000 volt transformer oil switches. The transformers are located just behind the wall on which the choke coils are shown to be mounted. The connections between the transformers and choke coils are carried over this wall supported by insulators similar to those supporting the choke coils. Fig. 30 shows the high tension outlets passing out through the floor of the hood. Fig. 32 shows the hood complete with the lightning arresters and incoming lines in front. The pole structure to the right is the outgoing 13,200 volt line.

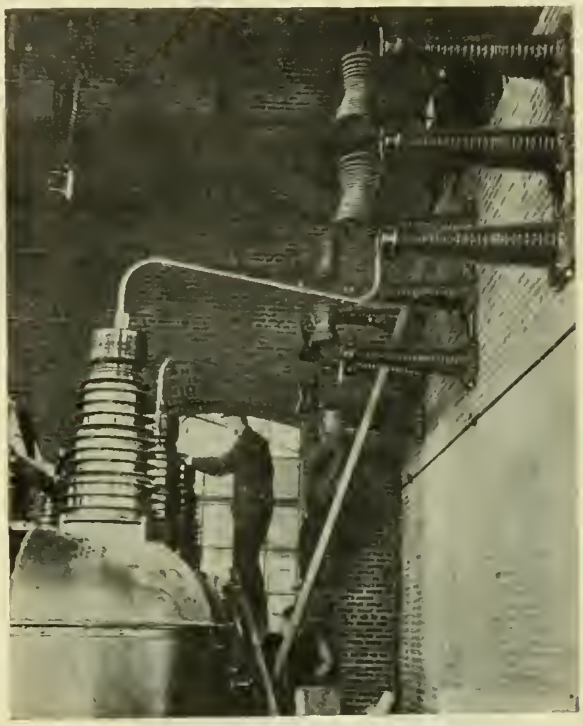


Fig. 29 - Choke Coils and Oil Switches, Berlin.

Berlin, in common with the other stations, is equipped with water and oil pumps supplied by the Canadian Buffalo Forge Company. The water pump is shown in figure 33, the oil pump in figure 38.

Berlin Distribution System

The 13,200 volt line which conducts the current from the Hydro-Electric Power Commission's substation to the Berlin distributing station is composed of two separate lines of stranded aluminum, which enter the Berlin station through Ohio Brass Company's 30,000 volt wall insulators into two Canadian General Electric Company's 15,000 volt oil circuit breakers, each 300 ampere capacity. The aluminium cable was supplied by the British Aluminium Company, Limited. The two lines are there connected to one set of bus bars running the length of the station. A graphic recording wattmeter is installed to read the total load from both lines on to the bus bars. Oil circuit

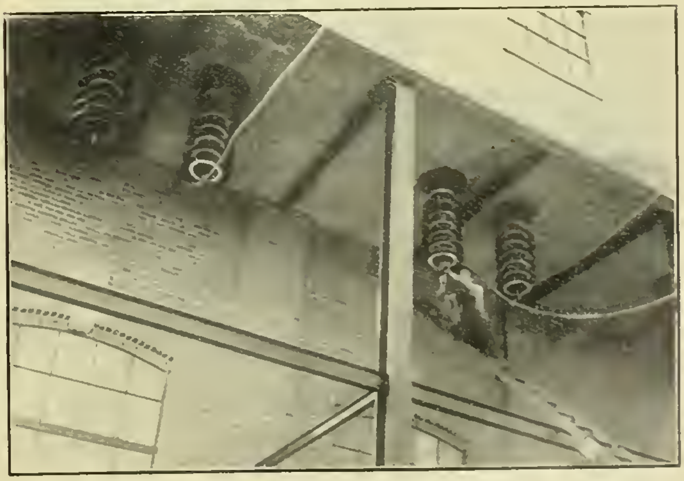


Fig. 30—Berlin High Tension Outlets below Hood.

breakers are installed between the bus bars and the sets of transformers.

Berlin, at the start, probably had the largest connected load of any municipal plant, and the matter was discussed as to whether the new distribution under Niagara power should be all 25 cycles, which would make the manufacturers throw out all their installed apparatus, or whether the town should put in rotaries and frequency changers and gradually change to 25 cycle as the load increased. This latter plan was adopted, and to carry it out one rotary of 250 k.w. capacity was installed to take care of the present street railway load. Another rotary was installed to take care of the d.c. motors and arc lamps, this one, also, later to be used for railway purposes after the d.c. system of motors is done away with. A frequency changer was installed to take care of the 60 cycle motor load and also to supply the lighting on the main street, so that in the event of Niagara power being off in the evening the large gas engine of the old plant could be started and the stores supplied with light and power. Also, the sewer farm pumps its sewage onto sand filter beds, and in the event of any long interruption to Niagara power the sewage can by this arrangement be pumped by the gas engine and save any inconvenience or liability of damages for non-pumping.

Superintendent E. J. Philip, of Berlin.

The frequency changer has a 410 h.p. synchronous motor on the same shaft with a 250 k.w., 60 cycle, 3 phase, 2200 volt generator, 500 revolutions per minute.

The current is supplied by three 200 k.w. transformers, 13,200 to 2,200 volt. The rotaries are supplied by six 100 k.w., 13,200 to 300 volt transformers. There is also installed a 375 k.w. synchronous motor, 375 r.p.m., driving a small 60 cycle machine, and a 500 horse power d.c. generator to be used for correcting power factor, or can be used to do work in case of interruption to a rotary. The small 60 cycle machine will take care of the load from midnight to morning, giving a chance to clean the frequency changer. These last machines were in use in the old station, the motor being the only one bought on account of Niagara power.

The ultimate intention is to remove some of the gas engines and make room for additional equipment, and also give more room for the present apparatus which was installed in the present power house in addition to the old equipment, which makes the room very crowded. The apparatus was supplied by the Canadian General Electric and Westinghouse, each getting about half the contract.

A few days previous to the official opening, on Sept. 19 and 20, a test was made of the Berlin station and Superintendent E. J. Philip obtained the first records on his recording wattmeter showing a load in the neighborhood of 400 kilowatts. Mr. Philip naturally considers these records valuable souvenirs and we are greatly indebted to his kindness for permission to reproduce the first record herewith, figure 31.

The distribution of power in Berlin has been in the hands of the Board of Berlin Light Commission, composed of Messrs. A. L. Breithaupt (chairman), A. R. Lang, Geo. Lippert, Sr., Dr. J. J. Walters, and Mayor C. C. Hahn.

Distribution in New Hamburg

New Hamburg was one of the original fourteen municipalities signing the agreement with the Hydro-Electric Commission on the 4th May, 1908. It is a town of about 2,000 population, situated on the main line of the G.T.R. between Toronto and Sarnia and about midway between Berlin and Stratford. on a loop of the Nith river which joins the Grand river at Paris. For its size it is quite a manufacturing town and expects quickly to dispose of the 250 h.p. it has contracted for.

Several months ago the municipality decided to purchase the local electric light plant from the owner, Mr. John Morley, and after a valuation and considerable negotiation arranged to purchase the complete equipment at $8,000, part of which was for goodwill. Arrangements were made at once to provide for a new plant to receive power from the Commission and tenders were awarded for apparatus and construction work was begun. The pole and line work have been completely overhauled to

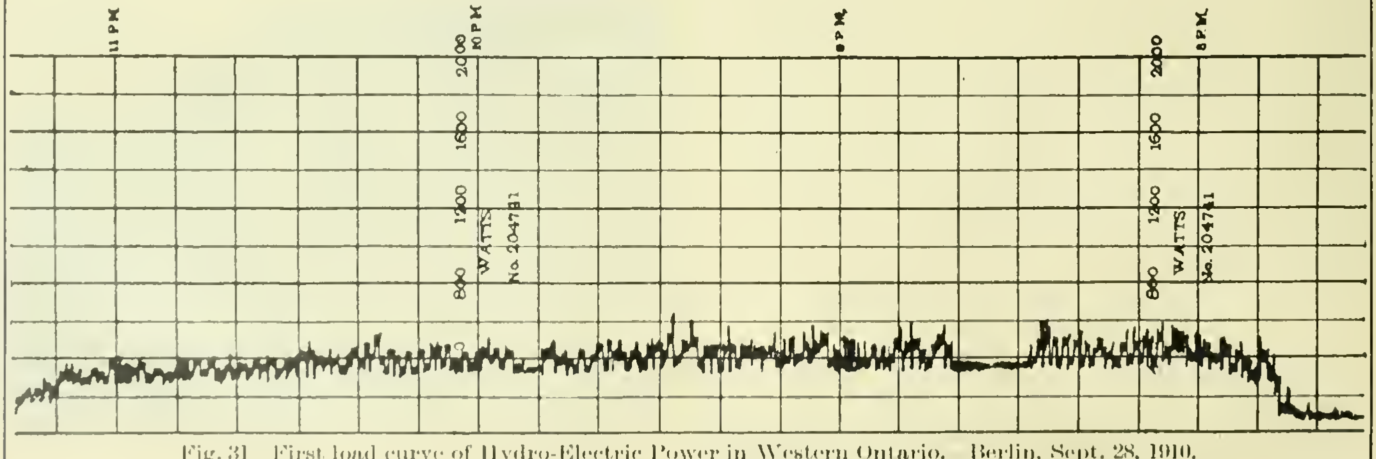


Fig. 31 First load curve of Hydro-Electric Power in Western Ontario. Berlin, Sept. 28, 1910.

meet the new conditions and when completed the system will be practically new throughout.

The old station is well situated near the centre of the town and has been retained as a transformer house, but is being completely remodelled to receive the new plant. Within this station the incoming 13,200 volt line from Berlin first passes through protective apparatus in the shape of aluminum lightning arresters and choke coils. The current then passes through two oil switches to two banks of transformers, 13,200-2,200 volts and thence to the switchboard which controls the outgoing light and power circuits.. Only one bank of three 75 k.w. transformers with its oil switch is to be installed now, leaving the second bank to be put in later.

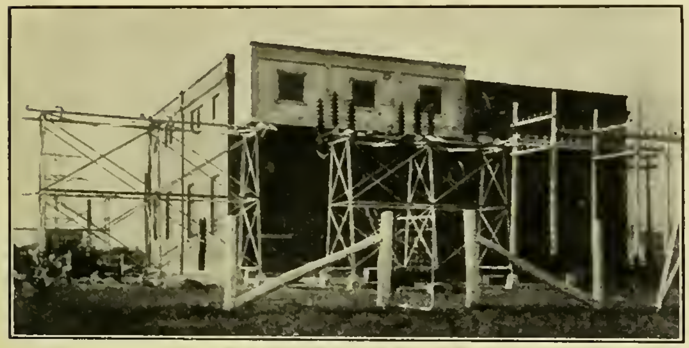


Fig. 32—Berlin Station, high and low voltage lines.

The pole and line work is nearly complete and shows one of the best samples of work in the western district. The poles and crossarms are painted a deep olive green throughout, making them attractive in appearance without being too conspicuous. Tree-trimming was systematically carried out with a view to forcing the trees upward, allowing better street lighting to be obtained.

Special attention is being given to the street lighting system. On both sides of the two main streets, the poles are placed at intervals of about 80 feet and on every pole there will be a specially designed double bracket carrying tungsten lamps. On all other streets each pole will have a single bracket. 60 and 40 watt lamps will probably be used for the two positions respectively. The lamps will be about 14 feet above the ground on the main streets and somewhat lower on the others. The street lighting is to be supplied from the secondaries of the house lighting service transformers by means of an additional wire for each section and consecutively operated remote control switches.

The three 75 k.w. capacity step down transformers are being installed by the Packard Electric Company, as are also the required number of service transformers to the sum of about 100 k.w. capacity for the distribution of light and small power throughout the town. The Canadian Westinghouse Company are installing the protective and switching apparatus.

Mr. J. F. Katzenmeier, the reeve, is chairman of the Light and Power Committee; Mr. William Millar is town solicitor and clerk. The pole and line work is being carried out by Mr. Geo. P. Thomas, contractor, of Windsor. The consulting engineer is Mr. Edward B. Merrill, of Toronto.

STRATFORD

Supplies Mitchell and Seaforth as well as local requirements—Local Company bought out—Both a.c. and d.c. Current.

Stratford receives the current next after Berlin, and its plan of wiring, shown in figure 35, is practically a duplicate of Guelph already explained. Current is stepped down for local service from 110,000 volts to 13,200, at which the city takes it in charge. The interior electrical equipment of the substation is exactly the same as is installed in the Guelph and Berlin substations, incoming and outgoing type "GA" hand operated Westinghouse circuit breakers being used, while all the other apparatus is, as before, supplied through the Canadian General Electric Company. Like Guelph, Preston and Berlin, all equipment is designed for 2,250 kilowatts, normal capacity, there being the usual four 750 k.w. transformers.

Stratford City System

Stratford city is one of the municipalities enjoying the honor of being in the original seven which, pursuant to the Act passed by the Ontario Legislature in 1903, undertook to have the feasibility of transmission of Niagara power investigated, and whose lead in the matter led to the appointment of the Ontario Power Commission, composed at the start of Messrs. E. W. B. Snider, P. W. Ellis, W. F. Cockshutt, Adam Beck, M.P.P., and Prof. R. A. Fessenden. The good work performed by this body does not need to be enlarged upon. It was the precursor of the Hydro-Electric Power Commission, and filled the place admirably until the time arrived when it was necessary to constitute a body with larger and wider powers. The seven municipalities above referred to were Toronto, London, Brantford, Stratford, Woodstock, Ingersoll and Guelph.

At the same time the introduction of Niagara power into Stratford has been keenly contested. No less than six by-laws have been voted upon by the city ratepayers, the first on Jan. 7, 1907, and the last on July 29, 1910. The subject has, however, been finally disposed of, and the electric plant and system of the Stratford Gas Company acquired, so that the municipal Niagara power enterprise starts out in control of the whole field. The city council of 1909 in the latter part of the year instituted an arbitration for the purchase of the local company's electric plant and system, the arbitrators, Messrs. H. A. Moore, E. B. Merrill and E. J. Philip, awarding the company the sum of $58,800, which included $15,000 for goodwill. This was included in the provisions of a by-law submitted to the people at the municipal elections last January for $105,800 to provide for local distribution. This by-law was defeated, due to the prevalent idea that the price for the local plant was too much.

At these same municipal elections for 1910 a Light and Heat Commission was brought into existence into whose hands was given the management of the new service as well as installing the local distribution system. The Commission was created and the commissioners were elected concurrently. The mayor is one of the Commission ex-officio, the other members being Messrs. Angus McDonald and J. J. Mason. Mr. Mason was elected chairman of the board, and Mr. R. H. Myers was appointed superintendent. To go back a bit, it may be remarked that Mayor Dingman was elected in January, 1909, on the Niagara power platform, since which date consistent progress has been made toward maturing the local part of the scheme.

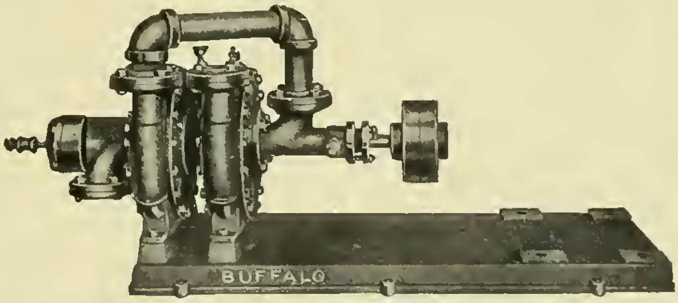


Fig. 33—Water Pump used in Berlin and other stations.

The defeat of the City Council's by-law in January threw upon the Light and Heat Commission the duty of proposing another plan to the ratepayers. This they did by presenting a by-law for voting on April 14, 1910, for $85,000 for a local distribution plant. The by-law gave the Commission power, if a close deal could be made, to purchase the local plant, but

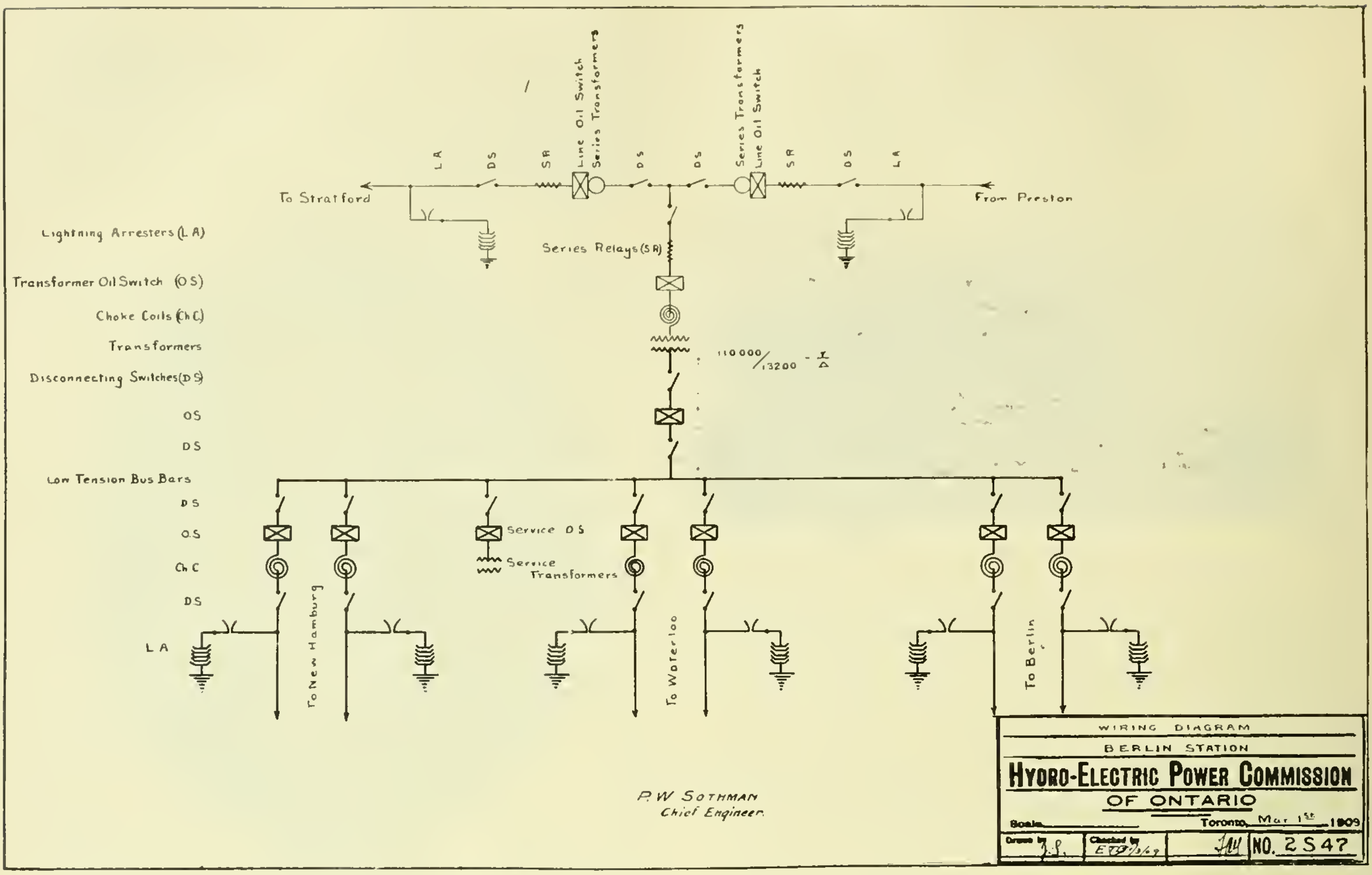


Fig. 34—Wiring diagram, Berlin sub-station.

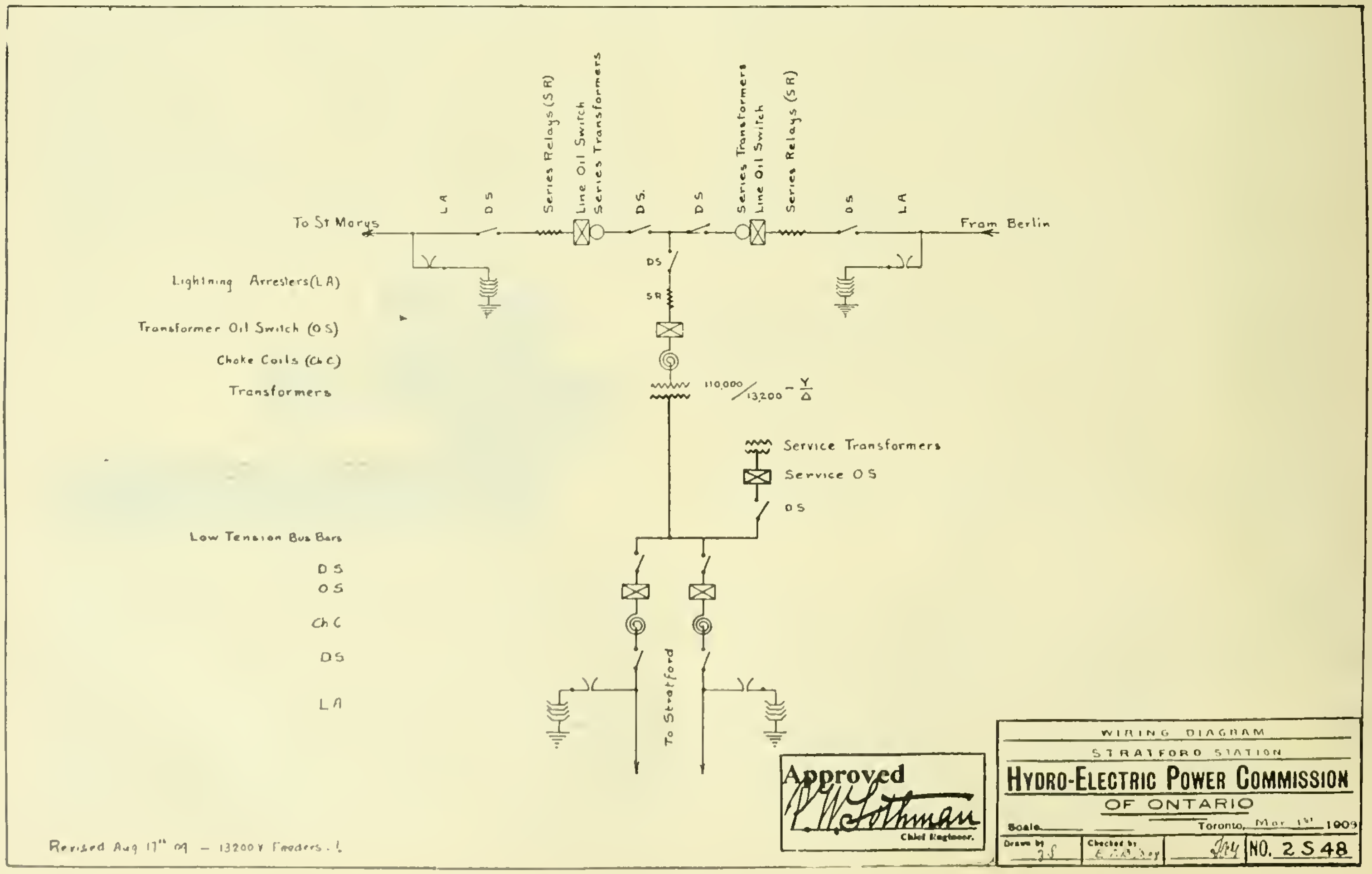


Fig. 35—Wiring diagram, Stratford sub-station.

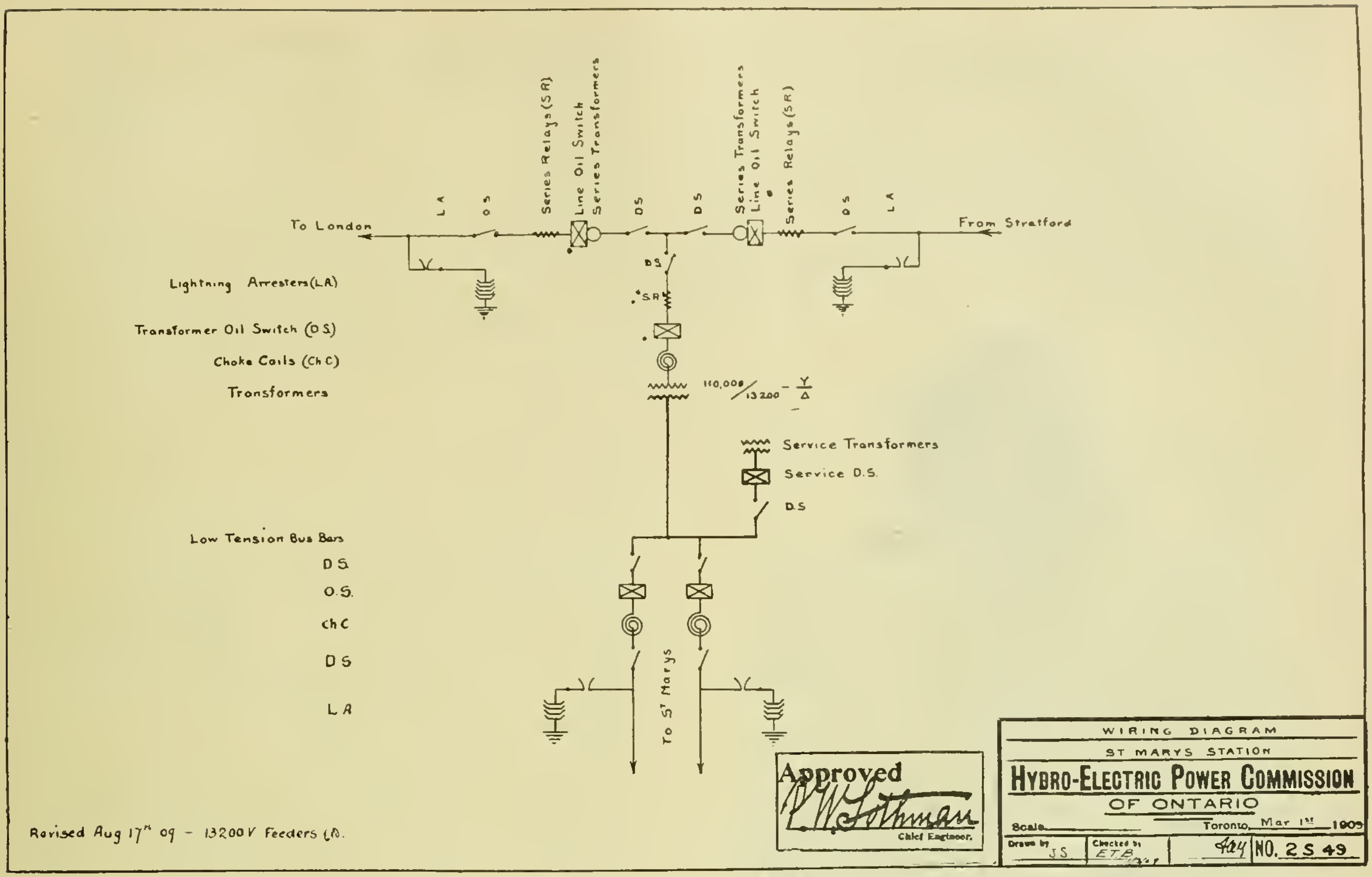


Fig. 36—Wiring Diagram, St. Marys Sub-station

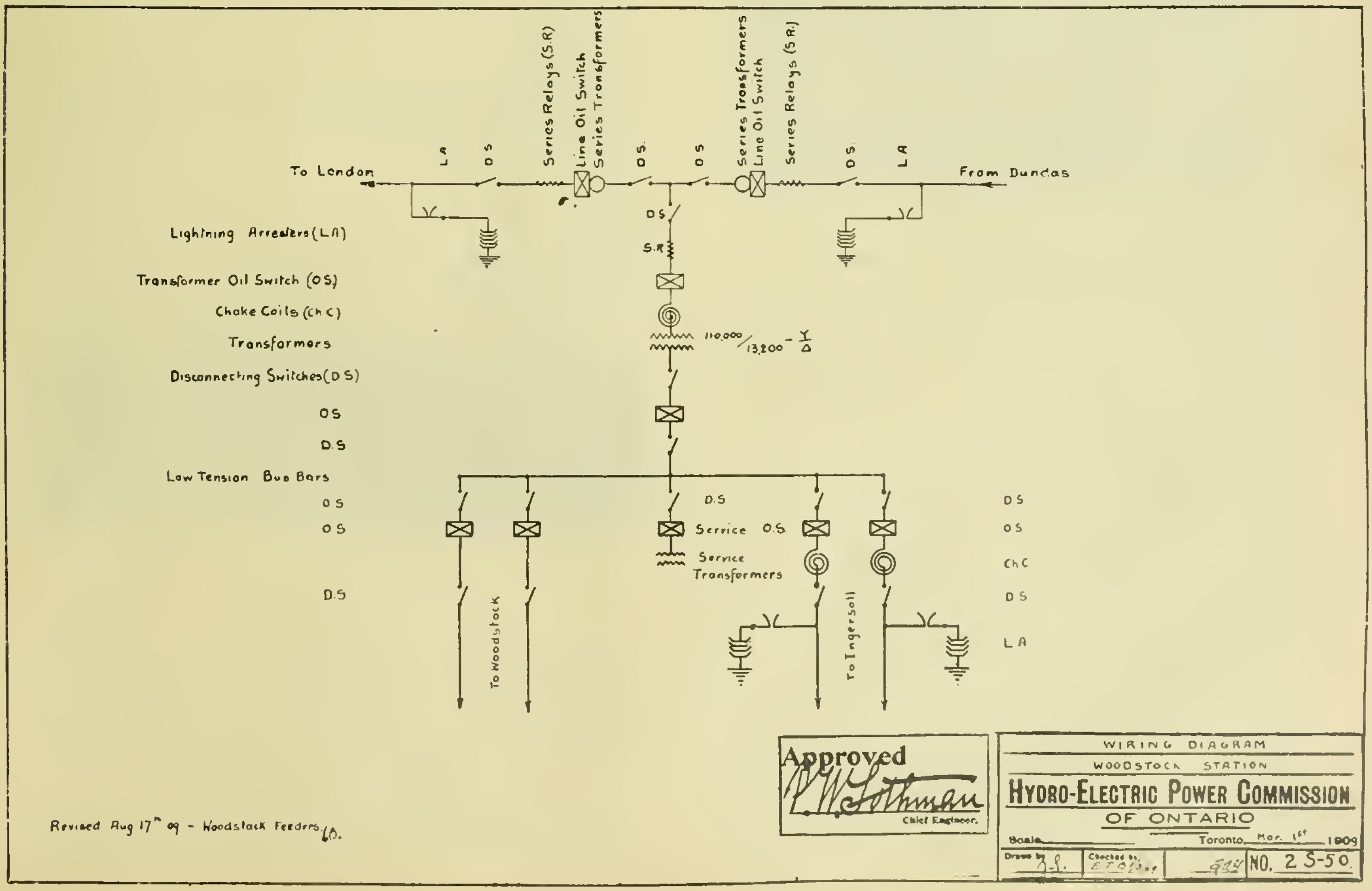


Fig. 37—Wiring Diagram, Woodstock Sub-station

before voting day the Commission thought it wise to declare by unanimous resolution that they would not execute such purchase without again consulting the people.

The $85,000 by-law carried by a decisive vote, and the Commission proceeded with a view to the installation of a civic system irrespective of the company's old system. It came about, however, that the parties were brought together again, with the result that the Commission found themselves able to make a lease of the company's plant and system for payment of $4,380 yearly, with proviso that such payments for ten years should make the property the city's. The Commission, however, had no power to make a valid ten-year lease, hence they made a lease for one year, with option of renewal, and engaged to procure from the ratepayers at the earliest practicable date authority to make complete purchase according to the pledge given in April preceding. The Commission were given such authority by the carrying of a by-law on July 29, 1910, by the substantial vote of 1,226 to 291, and accordingly have executed the purchase on the terms of quarterly payments amounting to $4,380 yearly for ten years, without interest, or equivalent to a cash payment of under $35,000. The local plant and system has been in the hands of the Commission since July 1, 1910, though the actual purchase was not effected until recently.

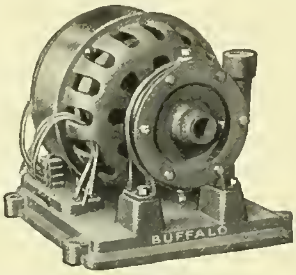


Fig. 38 – Oil Pump installed in Stratford and seven other stations.

The city had committed itself to take 1,500 horse power from the Hydro-Electric Power Commission, but it was felt that that amount was in excess of needs, or at all events carried too heavy an initial obligation. The Hydro-Electric Commission on the matter being represented to them in the fall of 1908 by Mr. Dingman (not then mayor), consented to reduction of Stratford's amount to 1,000 h.p., and in due course the reduction was arranged, the altered estimate of cost being $27.10 per h.p. per year.

The Commission anticipate that Stratford will not be long in reaching the amount contracted for, since the prospect of an inexhaustible supply from Niagara has quickened interest in electrical power, besides which the use of electricity for lighting and varied power purposes promises to grow as it has in other places, far beyond the present rather limited use. This year the City Council has granted a street railway franchise, the promoters agreeing to use Niagara power, and the new railway is expected to be in operation in the course of next year.

The old distribution system being in need of overhauling, and the old arc lamps being out of date, the Commission decided upon, as being cheaper and more satisfactory in every way, a complete reconstruction, and gave the matter into the hands of Mr. C. Leacock, as construction engineer. His handling of the work is giving the Commission excellent satisfaction, and the work is well forward. The plan of the new system will be understood from the following description:

Following upon the purchase by the city of the electric plant and system of the Stratford Gas Company, it was decided to utilize the company's electric station for the purposes of Niagara power distribution under the Light and Heat Commission. Accordingly a 13,200 volt transmission line is being erected to this central station from the Hydro-Electric Power Commission's transformer station at the city outskirts, a distance of 1½ miles. This line is a 3-phase, No. 2 stranded copper and the insulators are tested for 60,000 volts. The route of this line is mainly along the bank of Victoria lake.

The central station equipment will include one 13,000 volt panel and lightning arrester and three 13,000/2,200 volt transformers each of 150 k.v.a. capacity. For local distribution there will be one power panel and two lighting panels, with expectations of doubling in the near future.

There will be installed one motor generator set consisting of a 100 k.w. direct current generator, and a 150 h.p. alternating current motor. This set can be belted to the 300 h.p. auxiliary steam plant, making the a.c. motor a generator as well, or a 5,000-light steam driven auxiliary in event of Niagara power failure. Two direct current panels are to control the output of the motor generator, a 220 volt type with balancer for three-wire 220-110 volt mains. There will be five 16 k.w. constant current street light regulators and panels, to control 1,000 street lights.

Both alternating and direct current will be distributed through a limited district in the centre of the city. Throughout the ouside circle, alternating current only will be used. It is proposed to run a 13,000 volt line to the centre of the factory district, i.e., the eastern section of the city, and there reduce current for motors to 2,200 volts and 550 volts.

The lighting and power feeders are separately controlled at the central station. As a precaution for the protection of house consumers, all street transformers are grounded at centre of secondary winding. 200-light transformers are set in banks of three, giving a capacity of 600 lights in each section. There will be three sections in each feeder.

No arc lamps will be employed for street lighting. The streets will instead be illuminated by eight hundred 75 watt, 11.3 volt tungsten series incandescents. Along the water front of Victoria lake there will be 200 similar lamps, additional to the above, making 1,000 in all. The lamps will hang from a neat 6-foot bracket with scroll work brace, extending from the pole, with convex bevel reflector, enamelled, with copper top. The lights will be placed on every pole on both sides of the street in the business centre; in the first outside circle they will be on every pole on one side of the street; in the second residential circle, on every alternate pole on one side of street; outside of that, two or three poles may be skipped. There will be a light on every street corner, and it is calculated that every foot of land in the corporation will be lighted to some extent. The above street lights will be controlled by the five switch panels, each circuit being 200 lights.

Fig. 39 Woodstock Power House—Commission's Substation in rear.

Poles are spaced from 105 to 110 feet apart, being chiefly

30-foot poles, set outside of the walk and next to the curbing. Corner poles that are located out of line have bracket arms 8 feet long. Streets where paving prevents poles being located next curbing, are set inside the walk, and brackets support the wires.

The apparatus and material were supplied by the following firms: three 150 k.w., 13,000 volt station transformers, Allis-Chalmers-Bullock, Montreal; switchboards, street light transformers, Canadian General Electric; street transformers, Packard Electric Company, Westinghouse Company, and Canadian General Electric; street lights, John Forman, Montreal; poles, Wm. Gordon, Stratford; cross-arms, pins, insulators and bulk of pole fittings, John Forman; paint and fittings, local hardware men; street brackets, Dennis Iron & Wire Company, London; line wire, Canadian General Electric and Eugene Phillips Electric Company.

ST. MARYS

Wiring Diagram and Electrical Equipment a Duplication of other smaller stations—Will continue to use old 60 cycle apparatus

The towers between Stratford and St. Mary's, as well as south from St. Mary's to London, are single circuit towers, the only ones so far erected in the whole system. Otherwise the transmission line is similar to the other sections, No. 000 aluminum cable being used as before. The wiring diagram for St. Mary's, fig. 36, is again a duplicate of Guelph and Stratford. The current is stepped down to 13,200 volts and supplied to the city at that pressure. The substation equipment is identical with that in the other smaller stations, of which Guelph is taken as a type, and described at full length above. All electrical apparatus was supplied as before, chiefly by the Canadian General Electric Company, the Canadian Westinghouse installing, as in every other case, the incoming and outgoing high tension circuit breakers. Equipment is here also all designed for a 2,250 k.w. normal capacity, including four 750 k.w. transformers, one to be used as a spare.

The town will retain all its present 60 cycles apparatus and operate it at its full capacity for lighting purposes. All the power load will be on 25 cycles. One bank of Canadian General Electric transformers is being installed.

WOODSTOCK

Serves Ingersoll, Tilsonburg and Norwich—Local Plant Municipally Operated since 1901—Both 60 and 25 Cycle Current

At Woodstock is located the first substation, by the more southerly route, west of Dundas. The wiring diagram is shown in figure 37. The plan of installation followed corresponds exactly with the local substations already described and the transformation reduces from 110,000 down to 13,200. The low tension bus bars supply not only the local requirements of the town of Woodstock, but Ingersoll as well, some eight miles distant, Tilsonburg about twelve miles south, and Norwich, off the Tilsonburg line.

The electrical equipment again exactly duplicates Guelph, already described in full, is designed for a 2,250 k.w. capacity, normal rating and was installed as in the other smaller substations by the Canadian Westinghouse, which supplied incoming and outgoing high tension circuit breakers, and by the Canadian General Electric Company. The usual four 750 k.w. capacity transformers are installed here.

The Town of Woodstock

The electric light plant in Woodstock was taken over by the municipality in 1901. The total connected load at that date consisted of 600 incandescent and 72 street arc lights. A new plant was at once installed and the business has steadily grown until at the present time the connected load consists of over 10,000 incandescent lights, 90 street arcs, 85 commercial arcs and 250 h.p. in motors.

The system at present is 3 phase, 60 cycle; two C.G.E. 200 k.w. revolving field generators are belted to high speed compound condensing engines which are supplied with steam from three B. & W. water tube boilers of 220 h.p. each. These boilers also supply the water works, the pumping machinery being in the same building as the electric plant but separated by a fire wall.

Woodstock is perhaps the most fortunate in having the Hydro-Electric transformer station located near the city power house, it being built on the city property fifty feet to the rear of the power house, see figure 39.

In the service room of the Hydro-Electric station are placed three 300 k.w. 13,200/2,300 volt C.G.E. water cooled transformers; from here the current is taken through disconnecting switches and duplicate cables through underground conduit to another set of disconnecting switches in the city power house, thence to the receiving panel of the 25 cycle switchboard where the total load is measured. The second panel of this switchboard is for the control of the 350 k.v.a. synchronous motor which is mentioned later on. The third panel contains the switch, ammeter and curve drawing watt meter in connection with the water works pumping equipment. The fourth and fifth are feeder panels for two power circuits. Between the third and fourth panels an induction regulator is cut into the bus bars to regulate the voltage in the power circuits, as a considerable amount of lighting will be taken off these circuits.

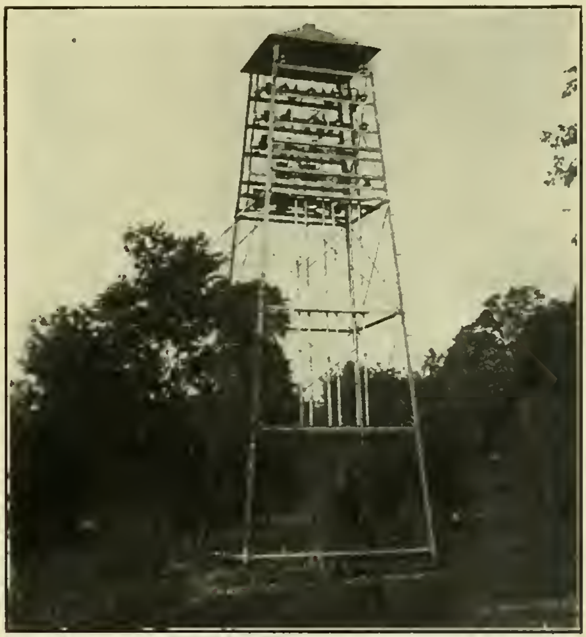


Fig. 40 – Distributing Tower, Woodstock.

The 60 cycle switchboard also consists of five panels, two generator, one feeder and two series arc regulating panels, each with a 50 light transformer of Western Electric Company manufacture. As practically all the 60 cycle apparatus including transformers and meters are of the latest pattern and in first class condition, it was thought advisable to continue the use of 60 cycle current in the centre of the city till such time as the apparatus was becoming worn or obsolete, and to this end a 350 k.v.a. synchronous motor was installed to operate one 60 cycle generator and also for power factor correction.

This motor is placed between No. 2 generator and its engine and is arranged to drive the generator with a short belt and in case of a serious shut down on the Hydro-Electric lines, the engine belt can be thrown on over the other and the engine started up, which will drive both motor and generator at normal speed. Also, by starting up No. 1 engine and generator, and throwing the generators in parallel, the synchronous motor can be run to its full capacity as a 25 cycle generator and supply current to the line; or should the accident be at night the motor would run light and the 60 cycle generators would supply the lighting circuits as usual.

The synchronous motor is equipped with a direct connected exciter having a capacity sufficient to excite both motor and generator. and for emergency use, a belted exciter of the same capacity is being installed.

The pumping equipment is located in an adjoining room and consists of two 1,500 gallon per minute, 4 stage turbine pumps, each direct connected to a 175 h.p. Canadian General Electric 2,300 volt induction motor. These pumps will operate at 80 pounds for domestic pressure on three stages and 110 pounds for fire pressure using four stages. As the city has a fine cement reservoir of one million gallons capacity the pumps will not be run during the heavy load hours and will be an important factor in keeping an even load on the system.

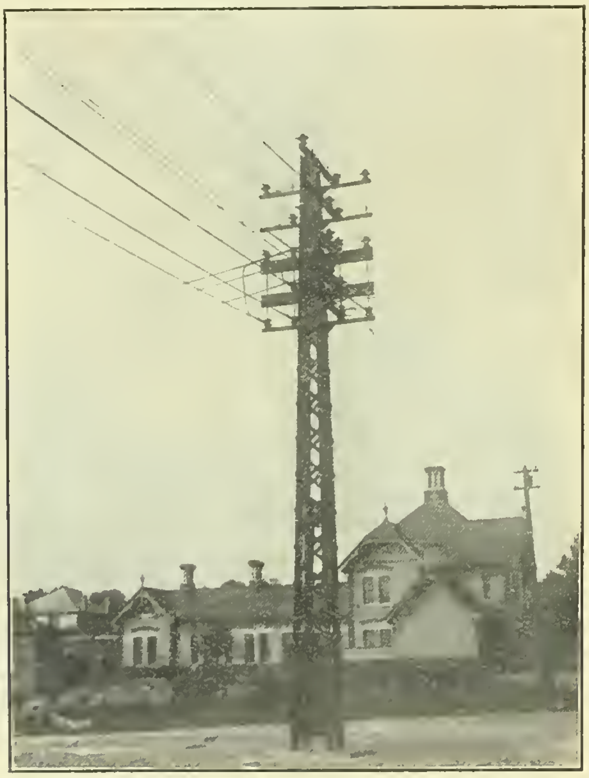


Fig. 41—Steel Tower at right angle turn in Distributing Line—Woodstock.

As the power station is located on the south side of the city and the manufacturing district runs around the west, south and east sides in a semicircle, it was found to be as economical and more reliable to distribute altogether at 2,300 volts, and this is done as follows:

From the switchboards all wires are run in lead cable underground to a terminal tower 80 feet west of the building, fig. 40. From this tower there runs north some 1,300 feet, before distributing, one 60 cycle circuit with six No. 4 wires, one 25 cycle with three No. 000, and one 25 cycle with three No. 1 cables and two No. 6 series arc circuits. The 60 cycle line runs to the centre of the city, the No. 000 25 cycle to the west and the No. 1 to the east factory district. A type of corner tower used is shown in figure 41.

Besides operating the street and commercial lighting and pumping the city water, the power will be used at once in the following lines of business:

Flour mill, 200 h.p.; knitting mill, 75 h.p.; textile mill, 50 h.p.; fence company, 30 h.p.; gun factory, 20 h.p.; machine company, 50 h.p.; box factory, 20 h.p.; foundry, 25 h.p.; machine shop, 20 h.p.; machine shop, 7 h.p.; mattress factory, 7 h.p.; printing office, 15 h.p., and several smaller motors of 2 to 5 h.p. each.

The larger factories in Woodstock being mainly woodworking, their power cost is naturally low and they are somewhat slow in making a change, but several of these firms have the matter under consideration and will in nearly every case install a certain amount of electric power in a very short time. Three new factories are being started in the city and will all run entirely by electric power.

The plant has been a success as a municipal venture, having a substantial surplus each year after paying all charges and has given low rates and a good service. It is expected that with the advent of Niagara power the system will be much extended so that every one may receive his share of the benefit of cheap power.

The system is operated under a commission, the members of which are: D. W. Karn, chairman, John Bain, Col. John White, J. S. Scarff, Mayor; superintendent and electrical engineer, J. G. Archibald.

LONDON

Electrical Equipment for 3,750 kilowatts—Two Local Substations being Erected — Four Mile 13,200 Line to Sprinkbank.

Wires enter the London station from both St. Mary's and Woodstock on to the same bus bar. The wiring plan is shown in figure 43. The conductors for the London supply, on leaving the high tension bus, pass through disconnecting switches, oil switches and choke coils in the transformers, where current is stepped down to 13,200 volts. Leaving the low tension bus bars the lines pass through disconnecting switches, oil switches, choke coils and electrolytic lightning arresters before leaving the station. From another point on the high tension bus, conductors lead off the current 20 miles south to St. Thomas, passing first through the usual safeguarding oil switches, disconnecting switches, choke coils and lightning arresters.

The electrical apparatus installed in the London substation is designed for a 3,750 k.w. capacity normal rating. The transformers were supplied by the Canadian General Electric Company, as were also the electrolytic lightning arresters, with their horn gaps and operating mechanisms, the high and low tension bus bars and connection work including switches, choke coils and insulating supports, the switchboard and all auxiliary wiring. The high tension circuit breakers for the incoming and outgoing 110,000 volt line are again type "G.A." Westinghouse, but in this station are, as in the Niagara and Dundas stations, electrically operated and equipped with condenser type bushings. The transformer equipment consists of four 1,250 k.w. capacity units, one being installed for spare.

London's Local System

The city of London has a population of approximately 50,000 people. The Hydro-Electric substation is located just outside the city limits and transmission of power at 13,200 volts by means of two separate circuits is made to what is known as substation No. 1. This station is a combined pumping and transformer station. At this plant there is being installed by the Hon. Adam Beck, who is under contract with the city of London for installation of the same, two 1½ million gallon centrifugal pumps driven by synchronous motors with the necessary air compressors; also a gas engine auxiliary. The reservoir is designed for 1,000,000 gallons.

In addition to this plant, there is what is known as No. 2 substation, in which will be located two banks of transformers reducing the pressure to 550 volts. The total capacity in this station will be 1,500 k.w. The energy at this station will be entirely used for power purposes as it is located centrally in the manufacturing district.

Running westerly out of the pumping station for a distance of four miles is an additional 13,200 volt line which supplies current for the operation of two 3-million gallon pumps driven by synchronous motors located at what is known as Springbank. The city owns at this point approximately 490 acres where springs are located, sufficient to supply in each 24 hours approximately four million gallons. This pumping station formerly has been operated by combined hydraulic and steam plant. It is now the intention to operate the pumps with Niagara power at off-peak hours and it has been calculated that, by careful management, this work can be done without raising the peak during any month and consequently without increasing the cost of current to the city.

The electrical transforming apparatus in London installed to date consists of three 200 k.v.a. oil filled, self-cooled units, single phase, 25 cycles, 13,200/2,200/1,500 volts, and one 25 k.v.a. single phase, 25 cycle, 2,300/220 volt unit, all supplied by the Allis-Chalmers-Bullock Company. Service transformers to the extent of 950 k.w. capacity, in small units, for distributing power and light throughout the city, are being installed by the Packard Electric Company.

The distribution of light and power has been placed in the hands of the Board of Water Commissioners, who have appointed a manager of the electrical department, Mr. Frank R. Dark, who guards the interests of the city during the installation of the apparatus and where differences arise with existing companies, and who will also act as business agent in the procuring of contracts for the city's Niagara power. Mr. Dark states that they expect to have from six to eight thousand customers within the next three years. The Board of Water Commissioners consists of Messrs. Philip Pocock, chairman, William Wyatt, Fred Darch and J. H. Chapman. The chief engineer is Mr. A. H. Vancleeve. J. H. A. Beattie is mayor.

ST. THOMAS

The Present Western Terminus—2,250 kilowatt capacity — City Power House to be used as Substation—Arc Lamps Continued.

St. Thomas, at the present moment, is the western terminal station of the whole system. If, or when, the line extends farther westward it will leave the St. Thomas substation. There are no new features about the wiring plan in this station, which is the same as Guelph, Stratford, St. Marys, etc., except that there is no outgoing high tension line. The transformers step down from 110,000 to 13,200 volts and there is the usual complement of disconnecting switches, oil switches, choke coils and electrolytic lightning arresters. The wiring plan is shown in fig. 44.

The equipment here also is an exact duplicate of Guelph and the other stations previously discussed. The capacity of all the electrical equipment is designed for 2,250 k.w. normal rating and was installed by the Canadian General Electric Company, the incoming 110,000 volt circuit breaker being the Westinghouse hand operated type. Four 750 k.w. transformers, one a spare, have been installed.

The installation of Hydro-Electric power in St. Thomas is being carried on under the direction of Mr. Jas. A. Bell, city engineer, and Mr. P. B. Yates of the Hydro-Electric Power Commission, consulting engineer. The committee in charge of the work are: R. N. Price (chairman), S. Chant, R. McCully, P. Meehan, M. B. Johnson, and W. K. Sanderson; the mayor is Dr. Frederick Guest.

Distribution in St. Thomas

The Commission's transforming station is located a short distance north of the city limits, and from that point the current is taken to the substation, which is centrally located. The building now used as the city power house will be used as substation. For this purpose the machinery at present in use will be removed to make room for the apparatus necessary to handle Hydro-Electric power. The work of construction at the station is being proceeded with as far as it is possible to do so without interfering with the machinery now in use. The equipment of the distributing substation, except the booster, is being supplied by the Canadian Westinghouse Company. The booster is supplied by the Lancashire Dynamo & Motor Company.

Line work has been carried on with satisfaction since it was commenced about seven months ago. A very important factor in the erection of the pole line has been a pole erector, which was designed and constructed by Mr. J. J. Roberts, construction foreman. By its use most of the poles have been raised by two men. This has obviously economized greatly in time and men. A photograph of the pole erector in operation is given (fig. 42).

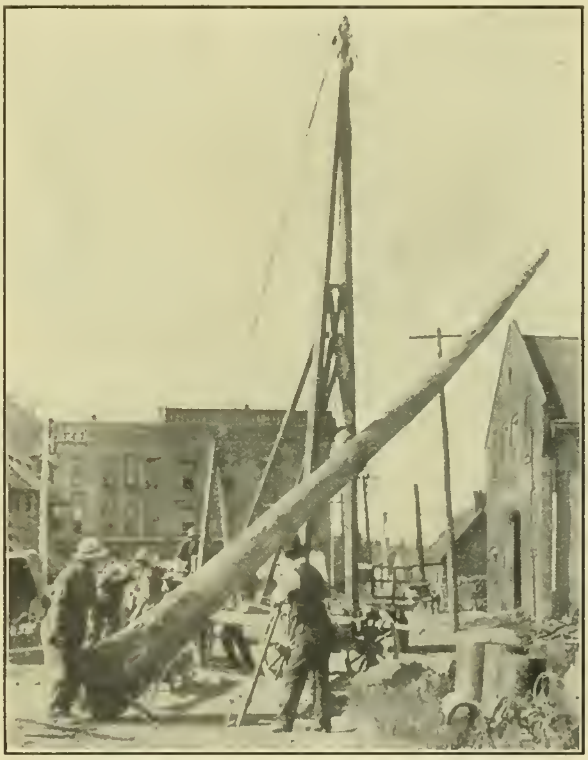


Fig. 42—Erecting Poles in St. Thomas.

With the exception of parts of five of the principal streets of the city, the city will be illuminated with tungsten lamps supported from the poles on four foot brackets. Six hundred and fifty tungsten lamps are to be used, and on streets so lighted, each pole will carry a light. Wherever possible, the poles have been placed in the boulevard close to the curb, and the lights suspended over the road at a height of about fifteen feet. On streets having no boulevard, it has been necessary to place the poles inside the walk, and in such cases the lamps are suspended at a height of about twelve feet above the walk.

Forty-six arc lamps suspended in the centre of the street will illuminate parts of five of the principal streets of the city.

The equipment for the street work is supplied as follows: Poles, by W. Mitchell, Port Stanley; cross arms and pins, by the F. Bissell Company, Toledo, Ohio; bolts, lag screws, etc., by G. W. Brown & Son, St. Thomas; insulators, by Ohio Brass Com-

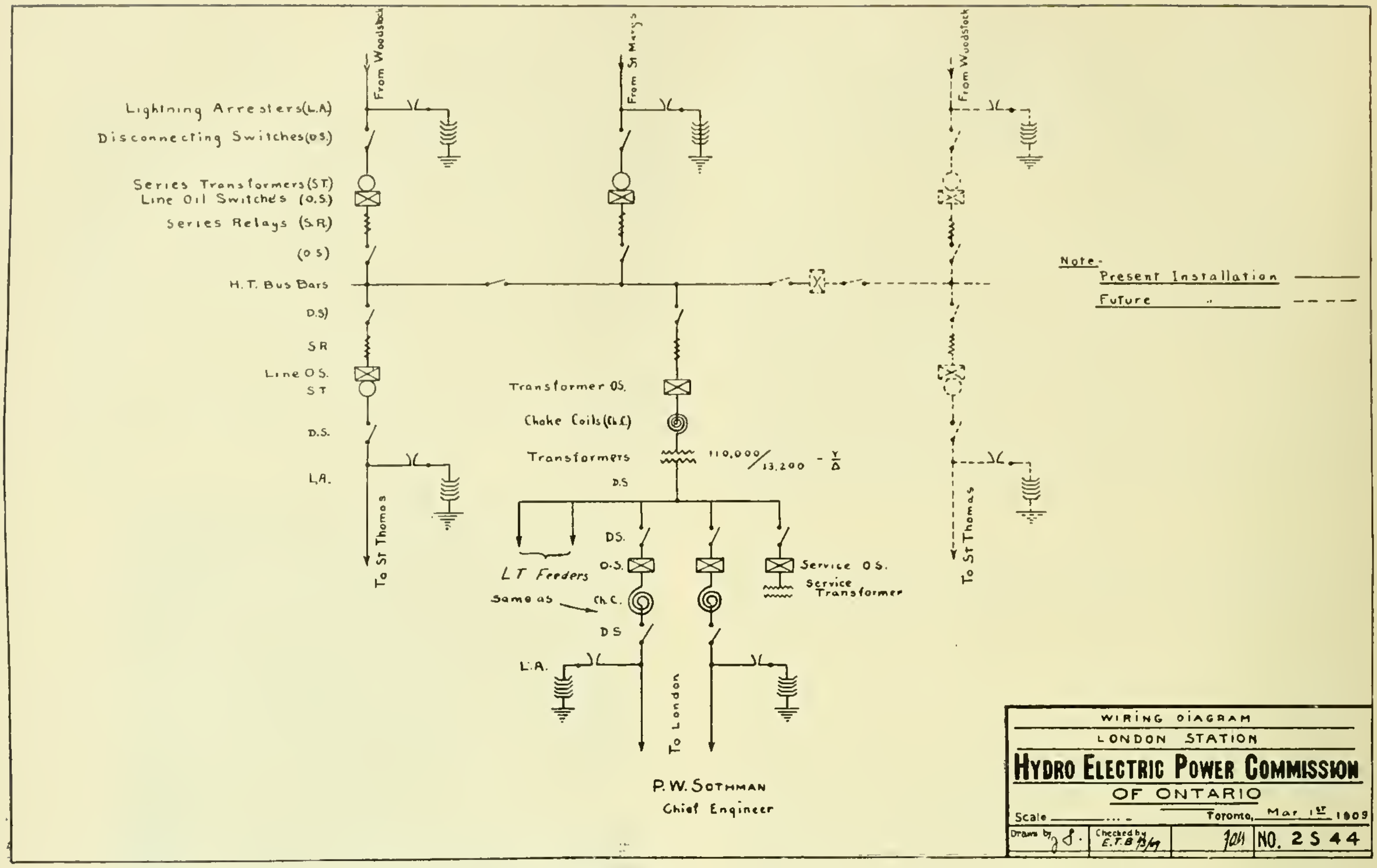


Fig. 43—Wiring Diagram, London Sub-station.

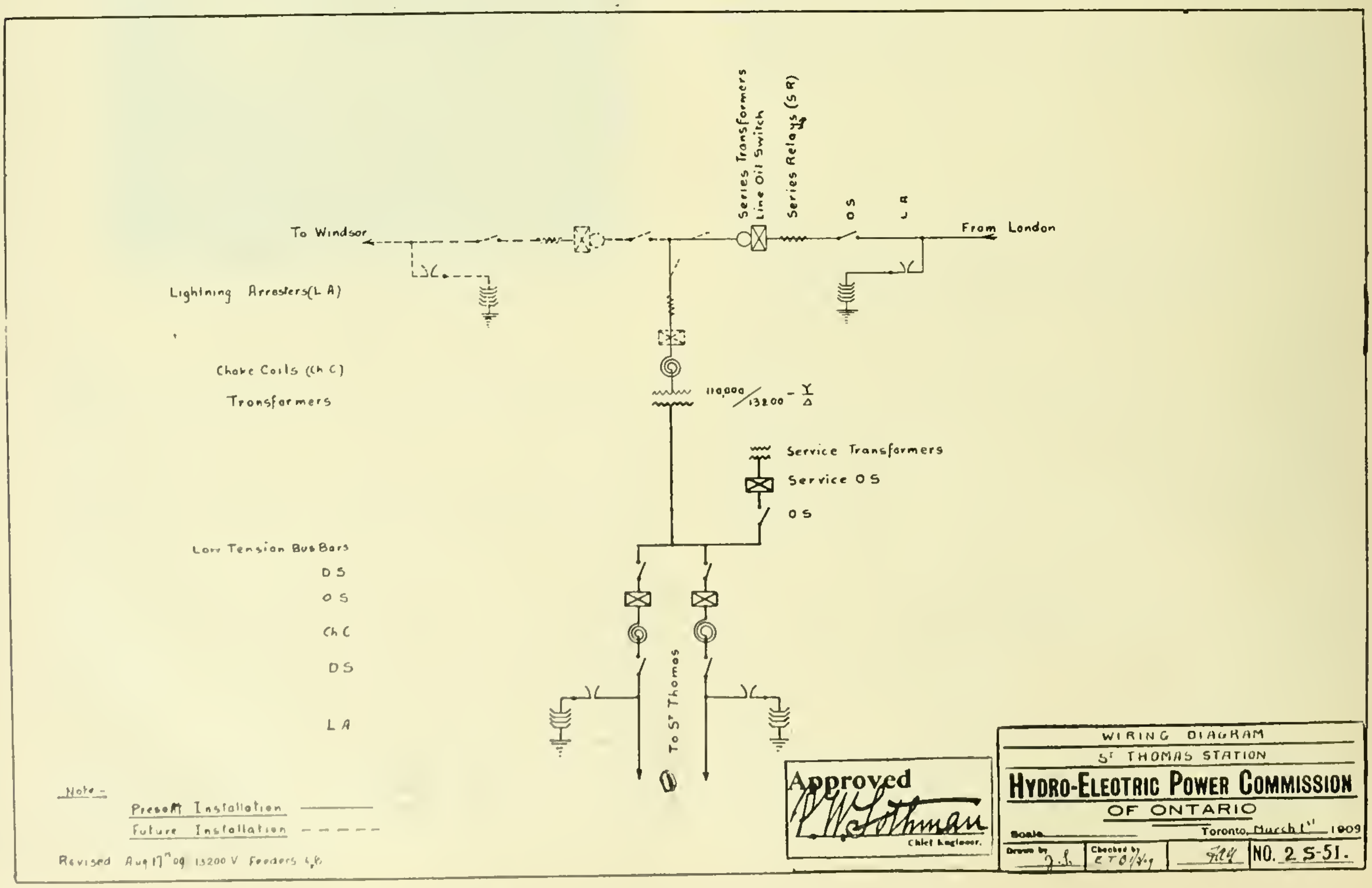


Fig. 44—Wiring Diagram, St. Thomas Sub-station

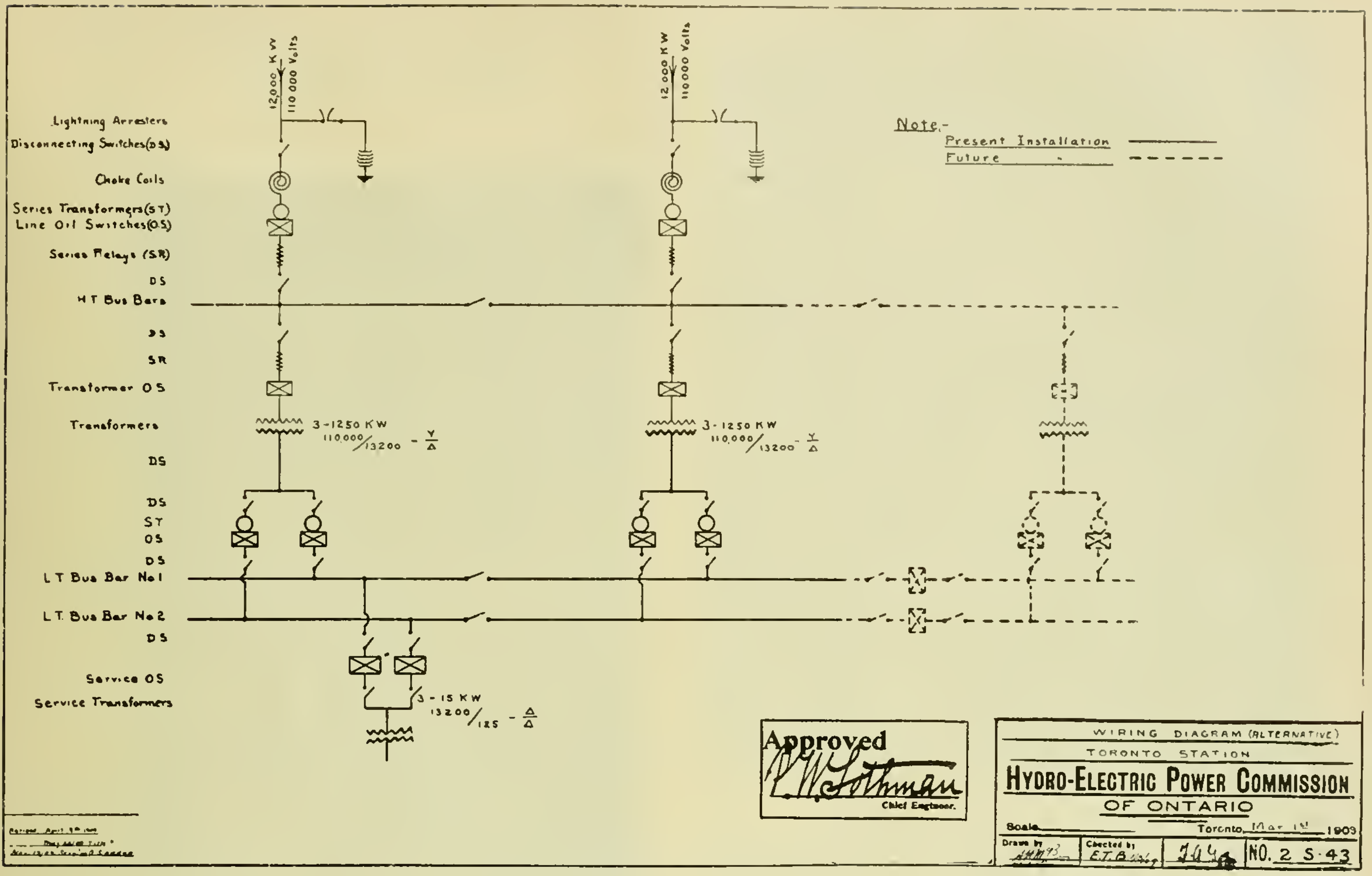


Fig. 45—Wiring Diagram, Toronto Sub-station

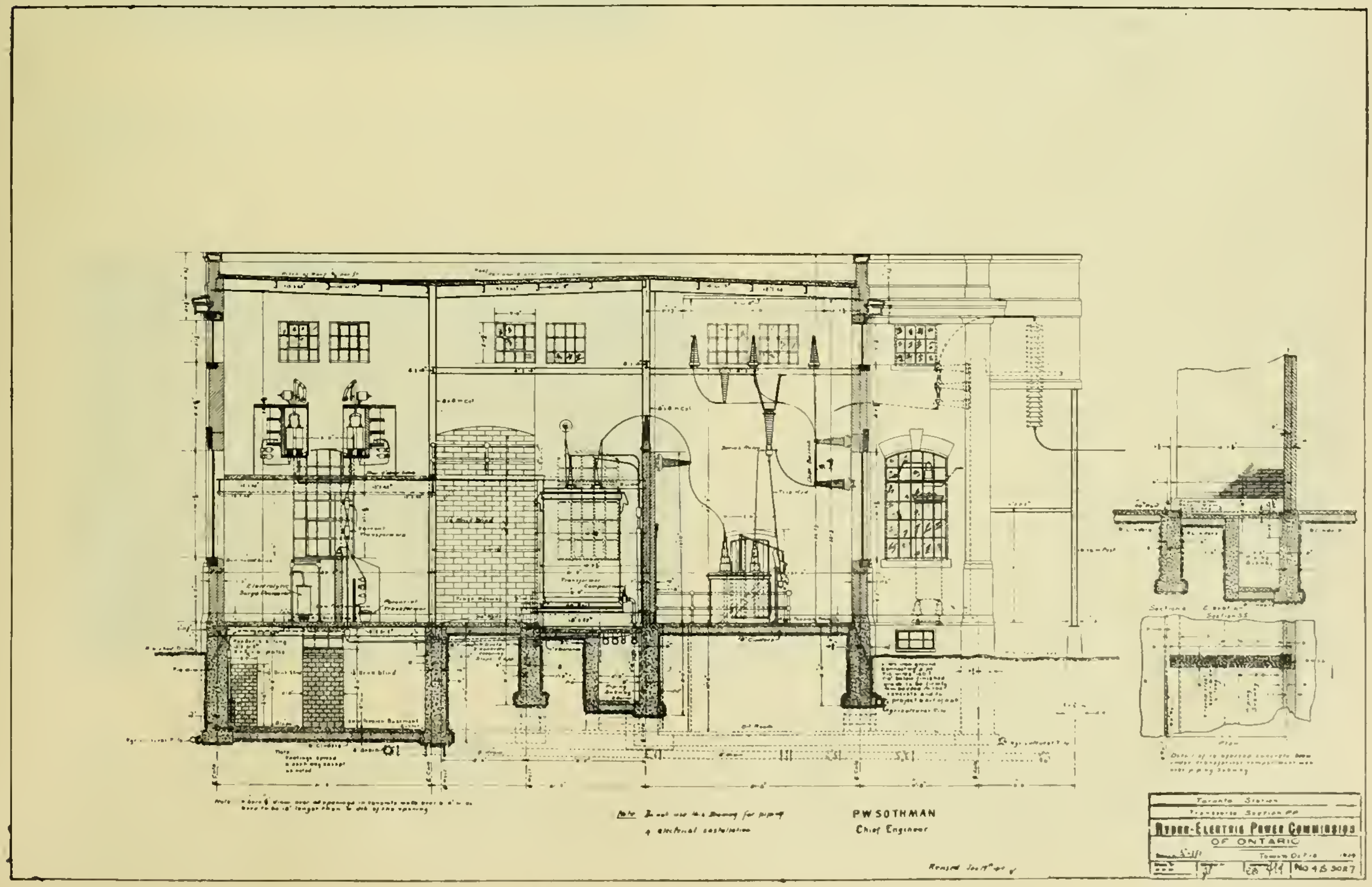


Fig. 46—Vertical Cross-section, Toronto Sub-station

pany, Mansfield, Ohio; wire, by Eugene F. Phillips, Montreal; street fixtures for series tungsten lighting, by Canadian General Electric Company; service transformers, by the Canadian General Electric Company.

It is probable that the Michigan Central Railroad and the John Campbell Milling Company will use hydro-electric power. It is also possible that current will be supplied for power and lighting purposes at Port Stanley. Many smaller concerns will also use power for commercial purposes.

PORT CREDIT

Substation Less Advanced than the others—Electrical Equipment 5,000 kilowatts—Brampton Served by 13,200 Volt Line.

A double line transmits current direct from Dundas to Port Credit along a double circuit tower line. The wire is aluminium cable, size No. 000 B. & S., supplied by the Northern Aluminum Company. The wiring arrangements are identical with the other stations. Port Credit at present is only taking 1,200 h.p., and Brampton 500 h.p., from this station, but it is believed that the location is favorable for manufacturers and that this amount will soon be greatly increased. The substation is not so far advanced as the others, work not having commenced until a quite recent date.

The step-down transformers being installed in the Port Credit substation consist of four 1,250 k.v.a., 25 cycles, single phase, 110,000 to 13,200 volts. These are being supplied by the Allis-Chalmers-Bullock, Limited.

TORONTO

The Largest Substation in the System—Equipment for 7,500 kilowatts—City Distributing System Partly Underground.

The current is led from Port Credit along near the shore line of Lake Ontario to Toronto on double circuit steel towers by a double line of No. 000 aluminium cable. The construction is the same as on other sections of the system except that near Toronto it has been found advisable for economic reasons to erect the towers out in the lake a short distance from the shore. The erection of these towers is now in progress. The length of line being so installed will be about two miles.

The plan of the Toronto substation differs from the others, as shown in figure 45. The incoming high tension lines pass through electrolytic lightning arresters, disconnecting switches, choke coils, oil switches and series relays, to the high tension bus bars, shown with their insulators in figure 48. From the busses the current again passes disconnecting switches and oil switches into the transformers, which step down from 110,000 to 13,200 volts. From the low tension side of the transformers the current is led on to a double set of bus bars from either or both of which the city may be supplied. Service transformers of 45 k.w. capacity, 13,200/125 volts, are also fed from the low tension bus bars. The Toronto substation equipment is designed for 7,500 kilowatt capacity, not taking into consideration overload possibilities. Two high tension lines enter this station, coming direct from Port Credit. The two disconnecting switches through which the 110,000 volt current enters are the Westinghouse type, electrically operated and equipped with condenser type bushings. The electrolytic lightning arresters for both high and low tension current were supplied by the General Electric Company as are also the transformers, the high and low tension bus bars and auxiliary work, including disconnecting switches, choke coils and all insulating supports; also the high and low tension transformer oil switches, also switchboard and all auxiliary apparatus for the low tension side. The transformer equipment consists of six 1,250 k.w. capacity units. A vertical section of the Toronto station is shown in figure 46.

Toronto's Local System

On January 1st, 1907, by a vote of the ratepayers, the municipality of Toronto was authorized to contract with the Hydro-Electric Power Commission of Ontario for 10,000 h.p., to be delivered to the city at 13,200 volts from the Commission's station located as near the centre of the city as it was possible to bring the 110,000 volt lines. At this time there was some agitation against the city's contracting for 10,000 h.p., as it was claimed that they had no demand for it for municipal power and lighting, and that it was not certain that they could dispose of this amount. For this reason the amount to be taken at first was cut down to 6,000 h.p., which can be readily used in the city's own power and lighting plants. In August the Council appointed

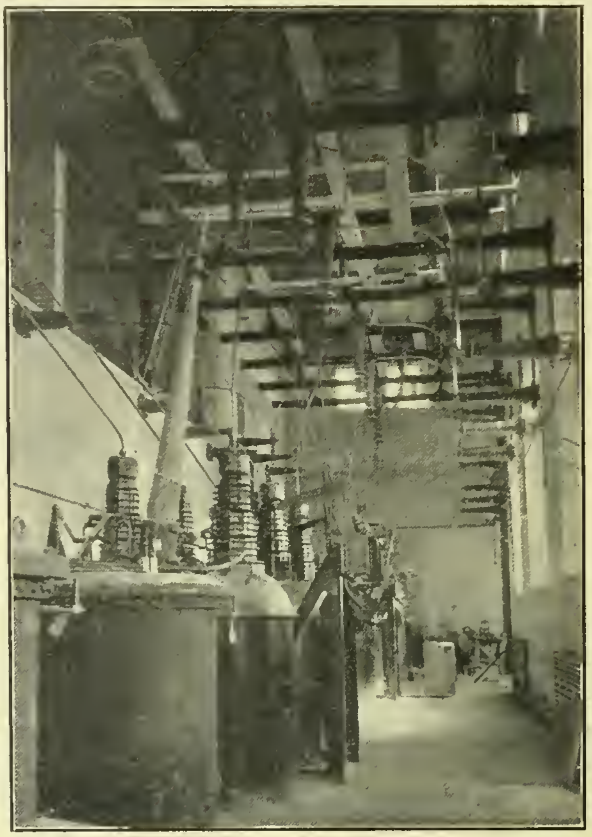


Fig. 17—C.G.E. Circuit Breakers, Toronto.

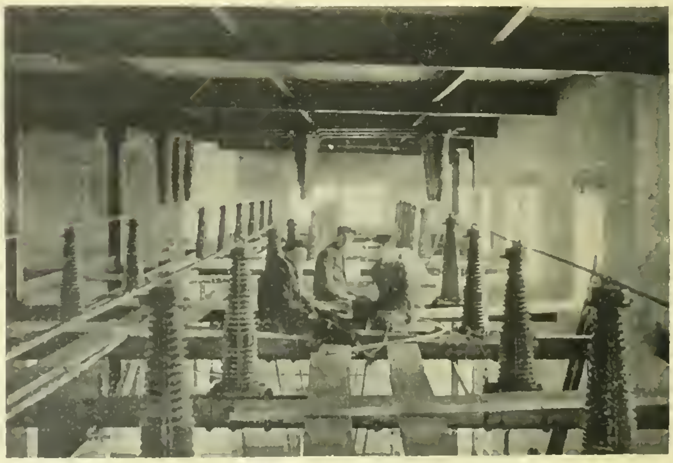


Fig. 48 High Tension Bus Supporting Beams, Toronto.

K. L. Aitken, electrical engineer, to design and construct a system to distribute this power, Alexander Dow, of Detroit, being retained as consulting engineer. The design of the system was proceeded with at once, and has progressed steadily up to the present time.

From figure 49 the location of the different substations throughout the city may be seen, and a general idea of the underground and overhead lines obtained. The dotted lines represent underground transmission. The city is to be surrounded at present by a ring of six stations, all connected together, and where the load demands it, having separate feeders running direct to them from the main terminal station. By using this system the danger of an interruption to the service is greatly diminished, as there will be three distinct lines by which the power may come from the terminal station to each substation.

The substation located at the main pumping station is for the use of the pumping motors only, this district being supplied with light and power from the Duncan street station. The equipment of this station consists of four 1,500 h.p. synchronous motors, for domestic service, and two 1,500 h.p. induction motors for fire service.

The high level substation is to be used for distribution of light and power, as well as for operating the pumping motors located here. These motors are of 500 h.p., eight in number, four being synchronous for domestic pumping and four induction motors for fire purposes.

The lighting load for the island will be carried from the substation at the filtration plant. There are two 225 h.p. synchronous motors for the Island service, and a number of smaller capacity induction motors for the filtration plant. It is proposed to carry the lines to this station across the channel on steel towers about 150 feet high.

The Underground System.

All the main cables leave the terminal station underground. The line to West Toronto runs about half a mile to the west, where it crosses under the railroad tracks; it then runs northerly. The main lines cross under the tracks (fig. 50 shows the method of laying the duct at this crossing) in two sections of 18 ducts each, and then run right through the business district feeding Duncan street, the main pumping station and the St. Lawrence market substation. The conduit is being supplied by the American Sewer Pipe Company, of Akron, Ohio.

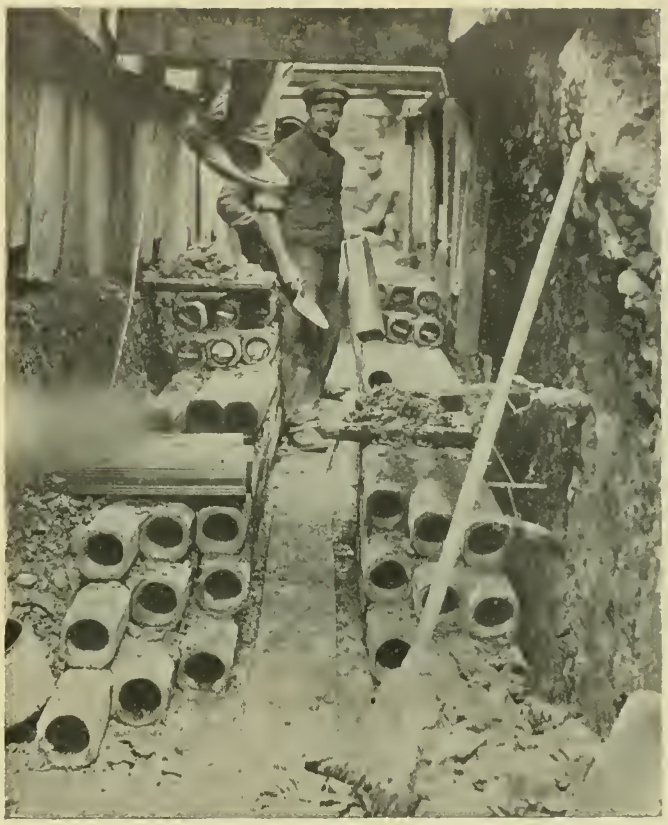
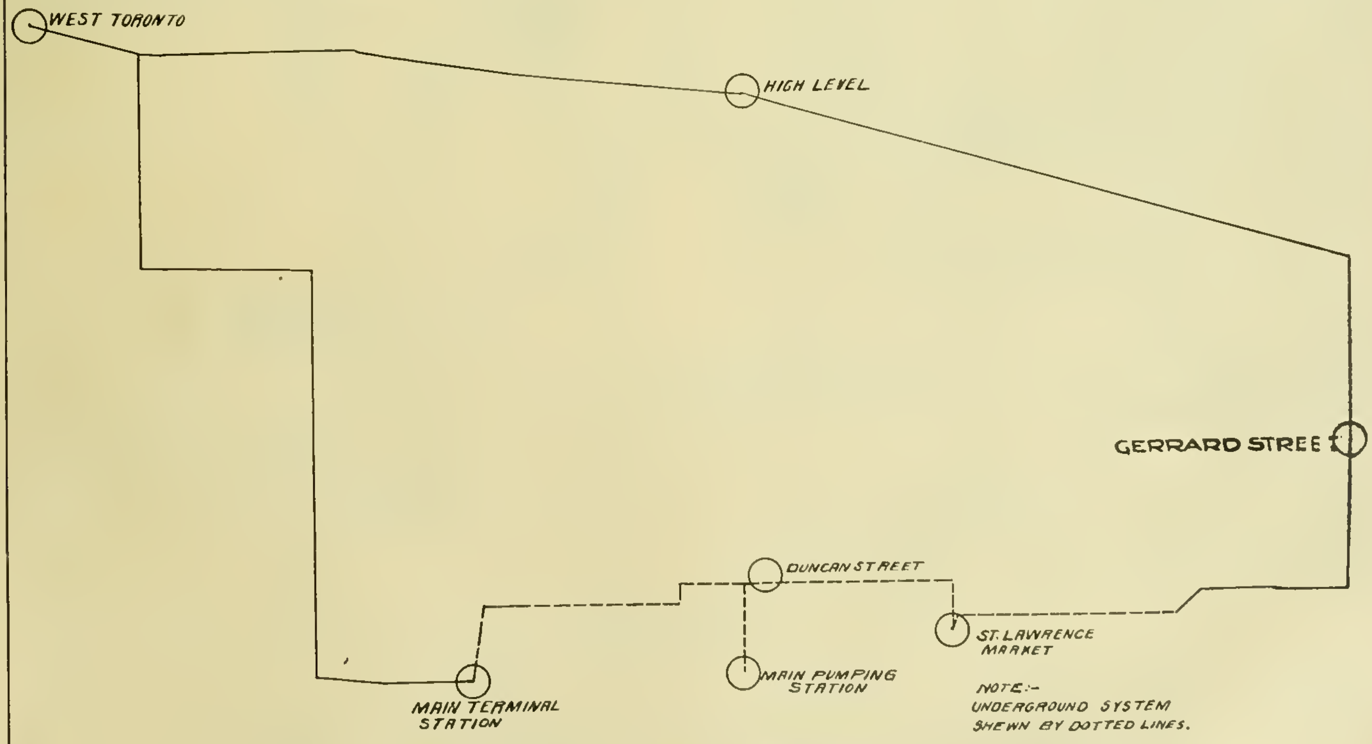


Fig.—50 Laying Duct, Toronto Underground Distribution

The accompanying cut, fig. 50, shows clearly the method of



NOTE:- UNDERGROUND SYSTEM SHEWN BY DOTTED LINES.

Fig. 49—Location local Sub-stations, Toronto—both underground and overhead districts

laying the duct for these cables. Each run is enclosed with three inches of concrete, and rests on a bed of concrete four inches thick. The minimum distance from top of duct to road level is 34 inches. The duct is known as single tile, and comes in sections 18 inches long, 3⅝ inches inside diameter.

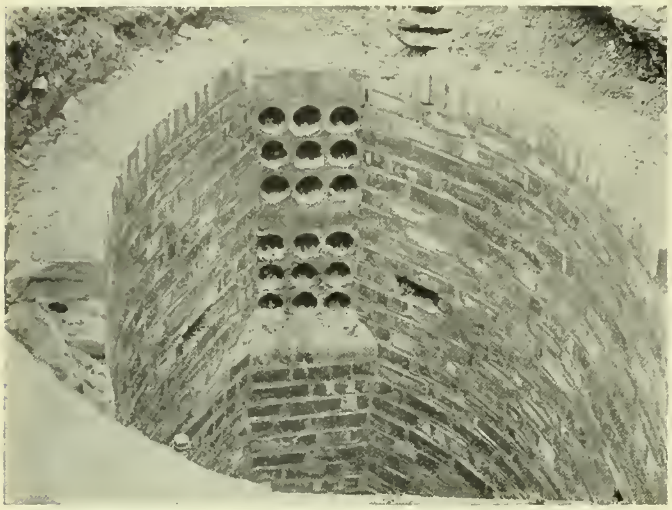


Fig. 51—Brick-lined Manhole, Toronto.

Manholes are located at intervals of approximately 300 feet throughout the entire length of the system, and are placed at the intersection of cross streets where possible, to facilitate the extension of the system on these streets when desired. The greatest distance between manholes is about 400 feet, as beyond this it is very difficult to pull in the cables. The manholes are of brick construction (fig. 51), with a concrete roof, in which a cast iron frame supported by I beams is set to carry the covers. Each manhole has a connection to the sewer to provide drainage.

Cables.

The cables for the main feeders consist of three conductors of No. 3/0 B. & S. gauge. Each conductor is wrapped with manilla paper, treated with insulating compound to a thickness of 7/32 of an inch. The three conductors are then covered with another wrapping of 7/32-inch of paper, the whole being covered with a lead sheath 1/8-inch thick; the lead serves as a protection to the paper, and prevents the entrance of water. The cable is being supplied by the Canadian British Insulated Company, who are also pulling it into the ducts and making the splices.

Substations.

The location of the various substations is shown by the circles on the map (fig. 49). It will be noted that starting from the terminal station they form a complete ring around the outskirts of the city, two 13,200 volt lines running through each one. As the load of a station passes beyond the carrying capacity of the ring feeders, separate feeders will be installed connecting it directly to the terminal station. Fig. 52 shows a typical substation and switching layout, providing for two direct feeders from the terminal station.

The arrangement of the ring feeders by means of which any section of line may be cut out without shutting off the station, is clearly shown. In case of trouble on a line, the switches in

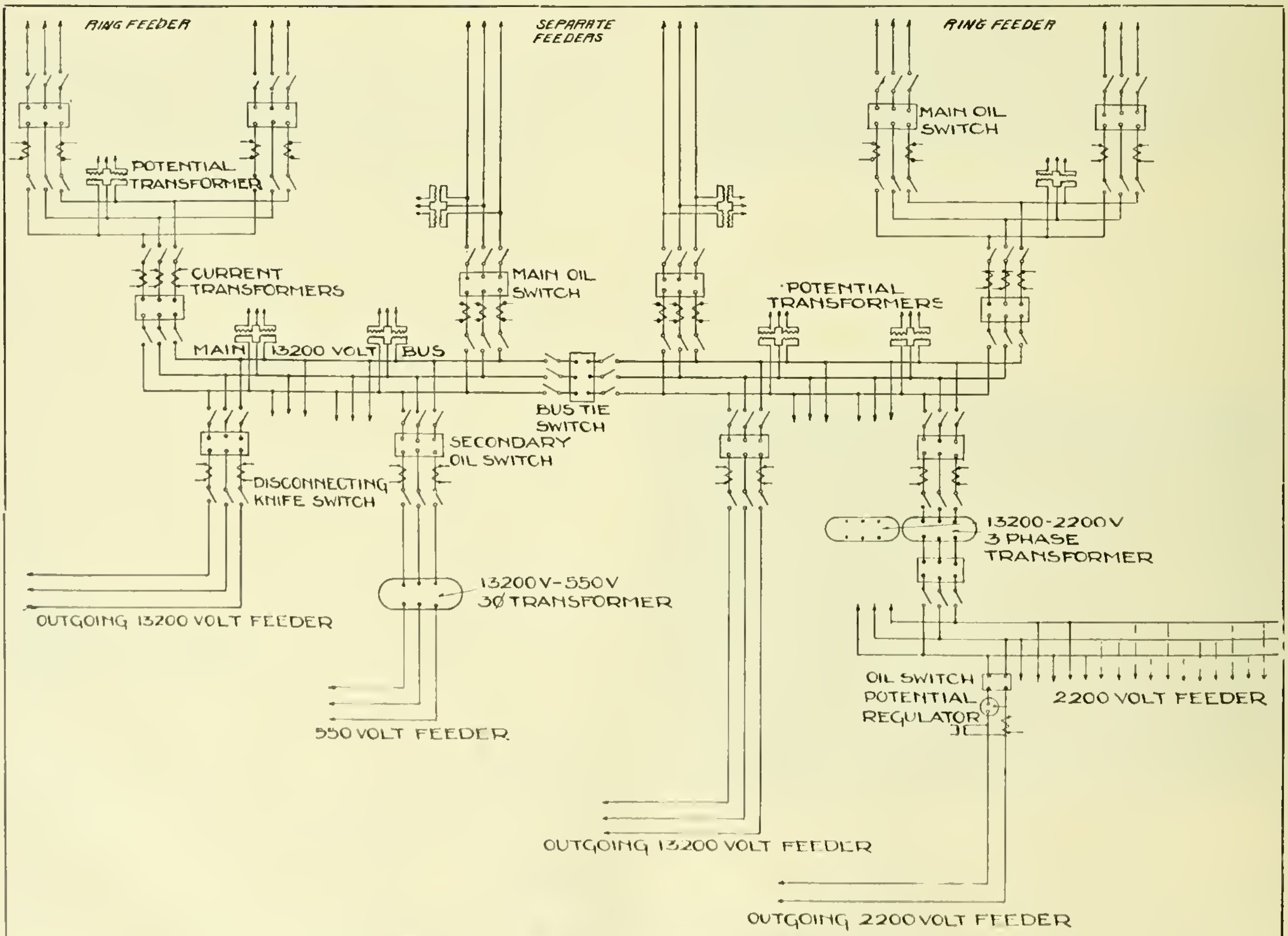


Fig. 52—Wiring Diagram, Typical Local Substation, Toronto.

the two adjacent substations are thrown out, each station still being fed from the other side of the ring.

The 13,200 volt oil switches are provided with disconnecting knife switches on both sides, so that they may be entirely isolated to allow for repairing and adjustment. Each 13,200 volt switch is also provided with two current transformers which operate the ammeters, power factor indicators and relays. The main switches feeding the bus have three current transformers, the extra one being required to operate the integrating and recording wattmeters, which measure the input of power to the station. All 13,200 volt switches will be electrically operated, those on incoming lines being motor operated, and the secondary switches being solenoid operated. Potential transformer sets consisting of two transformers are provided for each incoming feeder, and each section of the main bus has also two sets. The potential transformers operate the voltmeters, and are necessary for the operation of the power factor indicators and the wattmeters.

Transformers.

In the present installation three phase transformers of the oil insulated water cooled type are used throughout. They range in size from 1,500 k.w. for the main pumping station to 300 k.w. for the smaller substations; they may be replaced later by banks of single phase transformers having a larger capacity, and removed to other stations. They are of two different ratings, viz.: 13,200/2,200 volts and 13,200/550 volts. The 2200 volt service will be principally for lighting, and the 550 for power. The leads from the 550 volt service will run directly from the station to the network, the 2,200 volt will feed a bus in the station. This bus will serve sub-feeders, each being provided with a voltage regulator. These feeders will then run to different distribution centres, and feed their separate outworks.

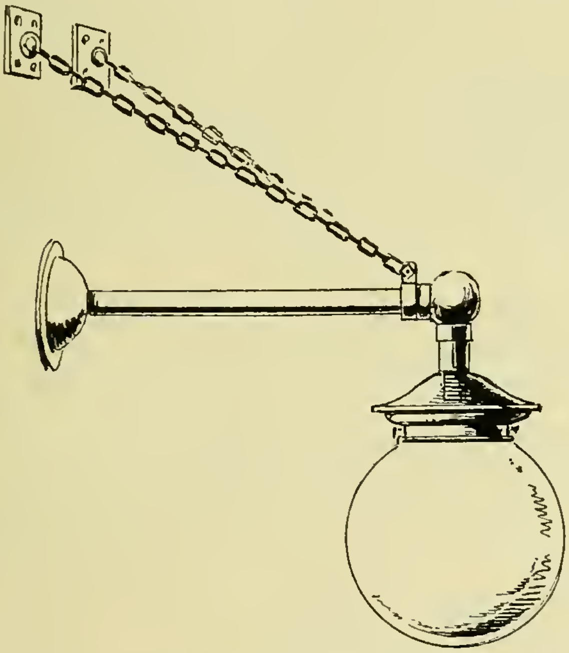


Fig. 53—One of the 500 Special Lighting Fixtures installed in the Substations.

Of the electrical apparatus seven 450 k.w., station type, oil filled, water cooled, 3 phase, 13,200 to 2,200 volt transformers and five 450 k.w. subway type, oil filled, water cooled, 3 phase, 13,200 to 2,200 volt transformers were supplied by the Allis-Chalmers-Bullock Company. The two 1,500 k.w. transformers were supplied by the C. G. E., as were also the small service transformers to the number of 140. The remainder of the electrical equipment was installed for the most part by the Canadian Westinghouse.

SUMMARY

While the foregoing pages describe more fully the purely electrical equipment of this unusually large system they do not, for lack of space deal at great length with the many auxiliary items which are scarcely less important in a complete electrical installation. For this reason and to avoid unnecessary duplication of words in describing the apparatus furnished by the various firms which have assisted in the construction of the completed system, we print here a more or less detailed summary, under the headings of the different firm names, of the kind, quantity and location of material supplied, with such comments as we believe will interest our readers or furnish additional information of the matter in hand.

Allis-Chalmers-Bullock, Limited, Montreal.

High tension transformers for Port Credit. Also distributing transformers for the cities of London, Stratford and Toronto.

Bernhardt and Gies, Preston.

Installed all the steam heating work for the Preston substation.

B. Greening Wire Company, Hamilton.

Large quantities galvanized crucible cast steel strand. Also large quantities copper clad steel wire.

British Aluminium Company, Toronto.

Filled an order for 500 miles of aluminium cable, for distributing circuits, varying in size from No. 2 to No. 0000 B. & S. The total weight of wire supplied is about 200,000 pounds and includes all the low tension wire for Waterloo, St. Thomas, Dundas, Hamilton, London, Ingersoll, Woodstock, Galt, Preston, Hespeler and Baden.

Canadian Rand Company, Toronto.

A combined air compressor and vacuum pump plant was supplied to each of the eleven stations by this company. The Niagara Falls plant consists of a class "E" combined air compressor and vacuum pump, having a cylinder 7-inch diameter x 8-inch stroke and a displacement of 64 cubic feet at 180 r.p.m., compressing air to a pressure of 30 pounds per square inch. It is driven by a 7½ h.p., 3 phase, 110 volt, Westinghouse induction motor through a fibre pinion on the motor shaft gearing into a cut steel spur wheel on the compressor shaft.

The other plants each consist of a 6-inch x 6-inch, belt driven, class "E" combined air compressor and vacuum pump, having a displacement of 39 cubic feet at 200 r.p.m. and compressing air to a pressure of 30 pounds per square inch. Each compressor is driven by a 5 h.p., 3 phase, 110 volt Westinghouse induction motor through a fibre pinion on the motor shaft gearing into a cut steel spur wheel on the compressor shaft.

These plants are all used in the substations for handling the oil, exhausting the air bubbles from the oil in their transformers, and for supplying positive air pressure to pump up the oil from the basement, and for cleaning the substation machinery, etc.

Canadian Fairbanks Company, Toronto.

All the valves in all the substations for the heating, water and transformer oil pipe lines. The valves required for use on transformer oil lines must be of the highest possible quality and this company's experience in equipping other hydro-electric plants at Niagara Falls doubtless assisted them in obtaining this contract.

Canadian Buffalo Forge Company, Montreal.

Supplied water and oil pumps for eight of the substations. Type "A" water pump was supplied to Berlin, Guelph, Stratford, Preston, Dundas and London. Type "B" water pump is installed in Toronto and Niagara Falls. Type "C" oil pump is installed in each of the eight stations. These pumps were all manufactured at the Montreal factory and are connected to Canadian General Electric motors at Niagara Falls and Stratford, and Westinghouse motors elsewhere. See figs. 33 and 38.

Canadian Contracts, Limited, Toronto.

Supplied the materials and carried out the construction of the underground conduit system connecting the Ontario Power Company's station with the Hydro-Electric transformer station, a distance of 2,500 feet.

Canadian Tungsten Lamp Company, Hamilton.

Lamp supplies and fixture parts.

E. W. Hyde, Jr., Toronto.

Bus and switch structure for the substation at Dundas, Guelph and Woodstock. Also carbolite carbolineum wood preservative for treatment of crossarms and poles for use on the telephone line and the local transmission lines in the various towns.

Edge and Gutteridge, Seaforth.

Erected the four transformer stations at Guelph, Berlin, Stratford and St. Marys. These buildings are absolutely fireproof throughout, being constructed entirely of concrete, brick and steel. The foundations are all of concrete, the walls and superstructure are of red brick one and one-half feet thick. The interior facings of all walls are of pressed brick relieved with Bedford cut stone trimming. Floors, gallery and roof are reinforced concrete, being supported by heavy structural steel. The windows are of steel, with heavy rolled wire glass.

Expanded Metal and Fireproofing, Toronto.

This firm supplied their Fenestra solid steel window sash for every substation in the entire system: Niagara Falls, Dundas, Woodstock, London, St. Thomas, St. Marys, Stratford, Berlin, Preston, Guelph and Toronto. They are also furnishing the same to three of Toronto's distributing stations and have the orders for Port Credit and Waterloo. The same firm supplied also quantities of Steelcrete expanded metal lath and their "NF Klutch bars" for reinforcement.

E. Leonard & Sons, London.

Oil storage tanks for the following stations: London, Stratford, St. Marys, Woodstock, St. Thomas and Paris (when constructed), two tanks for each station. The tanks are 72-inch diameter, 13 feet long, made of 3/8 plate in shell and 13/32 plate in heads, which are dished. Were tested to 150 pounds C.W.P. before being shipped. Also heating boilers for London and Dundas, 36-inch diameter by 10 feet long with 38 2½-inch tubes.

Ferranti, Limited.

Lighting and power meters. The lighting meters are the 110-volt, 25-cycle type; the power meters, the 550-volt, polyphase type.

F. H. McGuigan Construction Company.

Were the general contractors for the construction of the transmission and telephone lines.

Galt Malleable Iron Company, Galt.

Supplied the clamps which carry the wire under the insulators. These clamps are malleable iron, galvanized. Great care was necessary in the manufacture of these to get them of the required strength and the tests applied were very severe.

Gurney Foundry Company, Toronto.

Supplied the following heating equipment for the substations: radiators for Dundas, Niagara Falls, Toronto substation and distributing stations; boilers for St. Thomas, St. Marys, Berlin and Stratford.

Hyatt Brothers, London.

This contracting firm obtained the contract for the construction of the London substation. The foundation is eleven feet underground. Work was carried on during winter of 1909-10, including the placing of the concrete roof. To guard against frost injury to the concrete when setting, this firm employed a traction engine connected to a system of steam pipes some 1,500 feet long which were placed around the building and kept filled with live steam day and night for about two weeks.

John Inglis Company, Toronto.

Installed boilers, one each in the Niagara Falls and Toronto substations, 36 inches by 10 feet, 100 pounds working pressure. Also the following transformer trucks: one 25 ton transformer truck in each of Toronto, Guelph, Berlin, Preston, Woodstock, London, Stratford, St. Marys, and St. Thomas, and one 45 ton transformer truck each for Dundas and Niagara Falls.

John Hayman and Sons, London.

Contract for erection of the substations at Dundas, price about $40,000; at Niagara Falls, about $50,000; and Preston, Woodstock, St. Thomas and Paris (when built), at about $20,000 each. All these buildings are of steel, red pressed brick, reinforced concrete and cut stone.

J. L. Vokes and Company, Toronto.

Various kinds of hardware.

Jenks-Dresser Company, Sarnia.

Have furnished the structural steel for the Berlin substation and the St. Marys substation and have the contract for Port Credit. The structural steel for one of these buildings varies in weight from 35 to 60 tons. The buildings are fireproof throughout. The use of structural steel is mainly for the framework and to support the roof. In some cases steel framework has also been used to support the wiring, transformers and other machinery. In this contract is also included the track and its supports for the heavy lifting cranes.

James Morrison Brass Works, Toronto.

Lighting fixtures and supplies for substations. These included over 500 lighting fixtures for outside service. These fixtures are of wrought iron finish, shown in figure 53. They are of substantial construction with chain supports and have weatherproof globe holder.

Keith and Fitzsimmons, Toronto.

Lighting fixtures and supplies for substations .

Locke Insulator Manufacturing Company, Victor, N.Y.

Telephone insulators for use on interstation telephone system.

Lancashire Dynamo and Motor Company.

Supplied booster set at St. Thomas and a double set of frequency changers for Guelph; also one pumping set comprising two motors and two pumps for Stratford, and two 200 h.p. motors for pumps and two 100 h.p. motors for driving air compressors, for London.

McGregor and McIntyre, Toronto.

Structural steel for substations.

Mussen's Limited, Toronto.

Furnished all the hand operated cranes installed, i.e., in every station but two. These cranes are 25 tons capacity; bridge travel varies from 14 to 16 feet; the lift is 26 feet. The cranes are fitted with a two speed arrangement, also a brake by means of which a load can be stopped and held at any point. They are fitted with a cable hoist and have a vertical hook lift.

Northern Aluminum Company, Toronto.

This company supplied the high tension, long span aluminum cable required, sizes No. 0000 and 000 B. & S., total weight 1,250,000 pounds. They are also under contract to supply 3,500,000 pounds of various sizes of aluminum cable for the low tension distributing circuits. The metal is manufactured and the cable drawn at their works at Shawinigan Falls, Quebec.

Northern Electric and Manufacturing Company.

Supplied a great quantity of line material such as weatherproof and bare copper wire, crossarms, insulators, hardware and pole fittings. Possibly the largest order of its kind ever placed in Canada was that given under tender to this company by the Toronto Hydro-Electric system, calling for 1,750,000 pounds weatherproof wire, assorted sizes, No. 2, No. 4 and No. 6, amounting to $252,500.

Noble and Rich, London.
Oil and water piping for substations.

Ohio Brass Company, Mansfield, O.
Large number of insulators used on the line, including about one-half the high tension suspension insulators. These latter required for 110,000 volts only, but actually furnished suitable for 150,000 working voltage. Recent 3-minute test at 200,000 volts fully sustained.

Packard Electric Company, St. Catharines.
Distributing transformers for the towns of Galt and New Hamburg, also pole type service transformers for the same towns; also pole type service transformers for the cities of London and Stratford and for Preston.

Purdy, Mansell Limited, Toronto.
Received the contracts for piping the substations at Niagara Falls, Dundas and Woodstock.

Polson Iron Works, Toronto.
Boilers and steam fittings for substations.

Royce, Limited, Manchester, England.
Supplied two 45 ton electric cranes for use in the Niagara and the Dundas substations.

Stromberg-Carlson Telephone Company, Toronto.
Installed the complete lighting system in conduit in seven of the substations—Toronto, Niagara Falls, Woodstock, St. Thomas, St. Marys, Stratford and Preston. In four of these, Toronto, Niagara Falls, Dundas and London, an automatic switch arrangement is installed for cutting in a storage battery to light the buildings in case of failure of power on the line. This company also installed the various telephone and switchboard supplies for the various substations.

Siemens Brothers, Toronto.
Furnished and installed the six high tension cables connecting the distributing station with the generating station. These are described elsewhere. The same firm also furnished and installed submarine telephone and relay cables for crossing the new and old Welland Canals at Allanburg and underground telephone and relay cables for carrying these circuits under the Toronto Power Company's high tension lines at both Silverdale and Port Credit.

Stratford Bridge and Iron Works.
Supplied and installed the steel work in the following half-dozen stations: Dundas, Preston, Woodstock, Stratford, London, St. Thomas.

Sunbeam Lamp Company, Toronto.
Lamp supplies and fixture parts.

The Canadian Bridge Company, Walkerville.
The entire contract for the furnishing completely of all towers and footings required on the line. The total order was for 3,094 towers, 2,305 being standard double circuit towers, 401 being single circuit, 282 being anchor towers and 28 special towers.

The McClary Manufacturing Company, London.
Enamel signs needed for the towers, amounting to about 3,200 in number, each 16 x 24 inches, blue ground with white lettering.

The Canadian Westinghouse Company, Hamilton.
Transformers, high and low tension circuit breakers and electrolytic lightning arresters, etc., for Niagara Falls. Transformers, high tension circuit breakers, high and low tension electrolytic lightning arresters, switchboard, etc., for Dundas. Also the incoming and outgoing high tension circuit breakers for every one of the substations. Every portion of this 110,000 volt equipment was manufactured complete in the company's Hamilton shops. Several smaller pieces of Westinghouse apparatus are also being used in the various distributing plants.

Canadian General Electric Company, Toronto.
High and low tension electrolytic lightning arresters with horn gaps and operating mechanisms; high tension bus and connection work including disconnecting switches, choke coils and all insulating supports; high tension transformer oil switches, main step down transformers, low tension oil switches, with busses and connections, switchboard and all auxiliary wiring and apparatus for the low tension side of the following stations: Toronto, Guelph, Preston, Berlin, Stratford, St. Mary's, London, Woodstock, St. Thomas.

The very rigid requirements of this installation made it necessary to use great care in the construction of apparatus as well as in its installation. It also made it necessary to devise special means for eliminating various electrical phenomena which appear at high potential on apparatus as it is ordinarily constructed. The test requirements for the apparatus also were unusual in some respects, particularly the feature of requiring double potential on the entire equipment of each station after its installation. This was considered necessary by the Commission engineers to make sure that none of the material or apparatus had been injured in shipment or handling while being installed. This necessitated the providing of a portable generating outfit of a size which would be ample for handling the lighting system of a fair sized town.

The shifting of this generating outfit, together with its transformers and other accessories between the various stations required especial skill and ability, as, owing to the extremely high voltage at which it must operate, a very slight injury might be attended by serious results, and its great weight, coupled with the lack of suitable roads at some points, added to the ordinary difficulties of transportation of such an equipment.

The Steel Company of Canada, Hamilton.
This firm supplied through the Canada Bolt & Nut Company branch a considerable quantity of bolts, rivets, etc., required in connection with the construction of towers. Much larger orders, however, were placed with another branch of the parent company, the Dominion Wire Manufacturing Company. These orders included 700 miles No. 10 B. & S. copper wire, amounting to approximately 116,200 pounds, this including the necessary copper connections; 700 miles (about 600 tons) galvanized steel cable, 7 strand, 5/16-inch diameter; 75 tons copper wire, gauges 8, 9, 11 and 12, with accompanying sleeves; 90 miles ¼-inch, 7 strand ground cable, 2,800 pounds No. 8 B.W.G. single strand galvanized wire and 45,000 feet of 3/8-inch galvanized guy wire, 7 strand.

Taylor, Forbes Company, Guelph.
Boilers and steam fittings for substations.

Western Lumber and Pole Company, Denver, Col.
Wooden poles for distributing systems.

Wood, Vallance Company, Toronto.
Hardware of various kinds for substations.

Witchall and Sons, Toronto.
Obtained contract for the erection of the Toronto transformer station at the foot of Strachan avenue.

W. D. Beath and Sons, England.
Supplied steel reinforcement for eleven transformer stations, including quantities of Beath's triangular mesh.

Watson, Jack & Company, Montreal.
About one-half of the number of insulators required for the transmission line were furnished by the Porzellanfabrik Hermsdorf, through their agents, the Watson Jack Company, Montreal. The suspension and strain insulators furnished by this company

were made in accordance with the design accepted and perfected by the Hydro-Electric Power Commission. The workmanship and finish of these insulators, as well as the material entering their manufacture are of the highest order and gave excellent proof of the thoroughness of European manufacture. In addition to the suspension and strain insulators the Hermsdorf firm furnished also the line entrances for the Niagara and Dundas stations. These entrances represent a remarkable piece of work and skill which could not be duplicated in this country or in America.

W. H. Banfield and Sons, Toronto.

Order consisted of 15,000 aluminium sleeves for both Nos. 000 and 0000 cable; aluminium purchased in England. Also supplied about 6,500 sign clamps, about 75 special snatch blocks for use in erecting the cables and a quantity of splicing iron for splicing the cables together, all these furnishings being of a special character and made from the company's own designs.

The Inauguration of Power in Berlin

The inauguration of the Hydro-Electric power service was fittingly celebrated at Berlin on October 11th. Special trains carried thousands of persons to the city, which presented a sight not unlike Pretoria night except for the greater preparation as reflected in the street lighting. On Main street the Hydro-Electric Commission had erected a magnificent arch supporting illuminated crests of the Province and the county of Waterloo.

Thousands were unable to gain entrance to the skating rink, where Sir James Whitney pressed the button about 4.30 o'clock in the afternoon. The building, which had been in semi-darkness, was immediately flooded with brilliancy, amid great applause, and many were the congratulations extended to Sir James and the Hon. Adam Beck.

The celebration concluded with a banquet in the large market building, at which 500 persons sat down. The menu throughout was electrically cooked, the equipment being furnished by the Simplex Electric Heating Company of Cambridge, Mass. It consisted of four ovens, five large disc stoves, three urns and a large radiator. all shipped out of stock on short notice and being perfectly standard articles for household use. This equipment was sufficient to handle the cooking for the 500 persons, roasting 100 chickens and 100 pounds beef, cooking all vegetables, soup, etc. To keep the plates warm the company built a large closet of lumber and installed a radiator in the bottom, which accomplished the desired result splendidly.

The exhibit of electrical apparatus in the rink was very creditable to the exhibitors, who made the necessary arrangements in a very short time. The apparatus displayed was confined chiefly to the smaller lines, electrical heating and cooking devices predominating.

An Unusually Interesting Foreign Plant

A Japanese Hydro-Electric Power Generation Scheme—Siemens Generators, Swiss Turbines, General Electric Transformers—30,000 H. P. Current at 57,000 Volts

The city of Tokio has just seen the completion of a large hydro-electric system, with a capacity of about 30,000 horse power. Current is generated at a distance of about 100 miles from the city and transmitted at 57,000 volts.

The generating plant is situated on the Katsura river, which takes its rise in the Fuji mountains some 12,600 feet high. The water is led from the intake to the power house by means of a canal about five miles in length. During its course the canal passes over seven tunnels and along several viaducts. Along the entire length of its course the canal is provided with a number of overflow wiers which lead off the water during the rainy season, a necessary precaution in that locality.

Figure 1 shows the construction of the pipe inlets with the power house below. There are six main pipe lines and a separate smaller pipe line for the exciters. The main pipe lines are 56 inches in diameter and about 1,000 feet long. About half way down the pipe-lines pass over a railway and, a little farther down, under a highway. The water enters the turbines from beneath.

The turbines ,which have phosphor bronze runners, have a capacity of 4,500 h.p. each under an effective head of 330 feet. They are Swiss manufacture—the Escher-Wyss Company type, shown in figure 2.

The six generators, figure 3, have a minimum capacity of 3,900 k.v.a. each. They were manufactured by Siemens Brothers Dynamo Works, Limited, of Stafford, England, and are of the 3 phase, 50 cycles, 500 r.p.m. type. The total capacity of the station is 27,500 horse power. The rotors of the dynamos are so designed as to act as flywheels with a momentum of about 5 tons.

For exciting the 3 phase generators there are two continuous current, 110 volt dynamos each having a capacity of 180 k.w. These also serve for lighting the power house, as either is sufficient to excite all six generators.

The generator units are arranged so that the shafts are par-

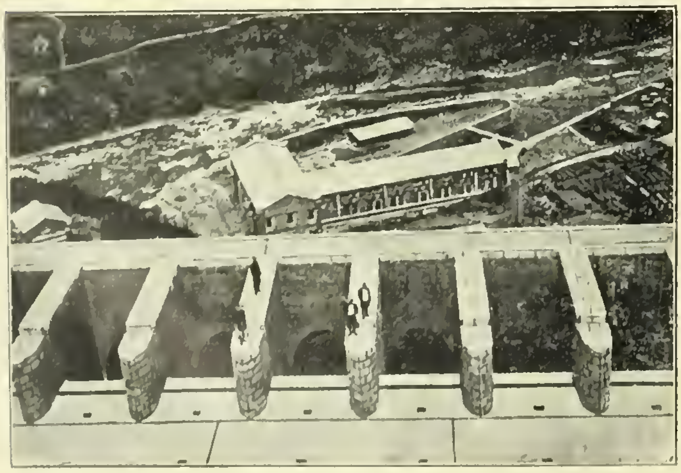


Fig. 1 Pipe Inlets, Power House in the distance.

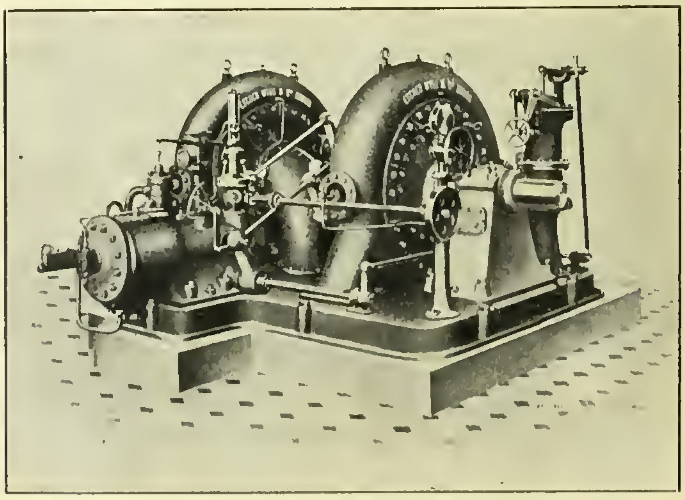


Fig. 2—Escher-Wyss Turbines, 4,500 H. P. each.

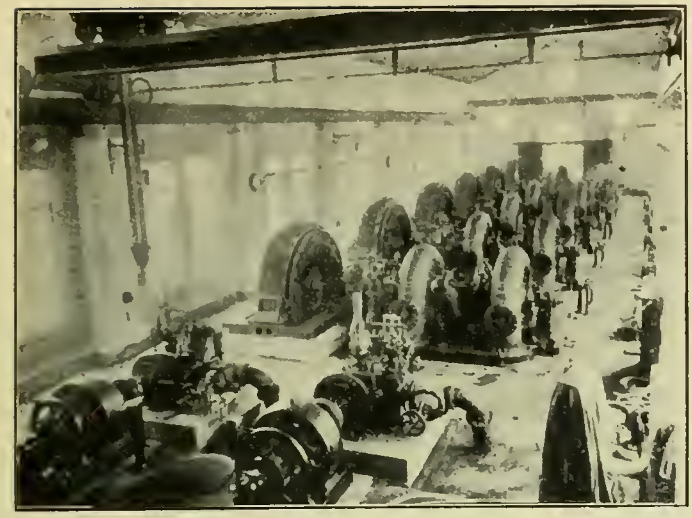


Fig. 3—Completed Power Station, 6 generators and 2 exciters.

allel to each other, the pipe lines entering on one side of the power house while down the other side are placed the separate discharge pits which lead the water into one common tail-race channel. This channel connects with the old river bed, which is strongly reinforced at this point.

Transformation is made to 57,000 volts by means of nine single phase transformers of 2,200 k.v.a. capacity each. The transformers are oil cooled and mounted on sliding frames. Each transformer is enclosed in a special fireproof tower, fitted with iron door. The transformers, switchboard of five panels and all switching apparatus was supplied by the General Electric Company of America.

The current is carried by a double wooden pole line. At different points along the line excess voltage is provided against by means of horn gap lightning arresters and resistances. The cable and wire work (all made of genuine Japanese copper) was installed by the Siemens-Schuckbert Electrical Works. Figure 4 shows the general plan of the plant.

Chapman & Walker Gets Contracts

The town of Swift Current, Sask., through the firm of Chapman & Walker, Toronto, is installing the following machinery:

One Crossley 208 h.p., 2 cylinder horizontal gas engine, 200 r.p.m., belted to an Allis-Chalmers 125 k.w. generator, 2,300 volts, 60 cycles, 900 r.p.m., 3 phase; one Crossley 54 h.p. single cylinder horizontal gas engine, 210 r.p.m., belted to an Allis-Chalmers 30 k.w. generator, 2,300 volts, 60 cycles, 1,200 r.p.m., 3 phase; one combined gas engine and compressor; transformers and exciters, complete; switchboard, belting, piping, etc.; one Crossley horizontal engine, 95 h.p. maximum, 170 r.p.m., to operate one turbine pump, 624 Imp. gallons per minute at 125 pounds pressure, 1,200 r.p.m., suction not less than 8-inch, discharge not less than 6-inch; one Crossley horizontal engine, 85 h.p. maximum, 170 r.p.m., to operate one turbine pump, 416 Imp. gallons per minute at not less than 6-inch, discharge not less than 5-inch; two pneumatic cylinders, 9 feet x 38 feet; all piping, belts, etc.; two Crossley suction bituminous type gas plants, each of 220 h.p., complete ;all outside work, comprising all wiring, poles, with eighty-five 100 watt tungsten lamps, transformers, etc. The price for the above complete is $45,750.

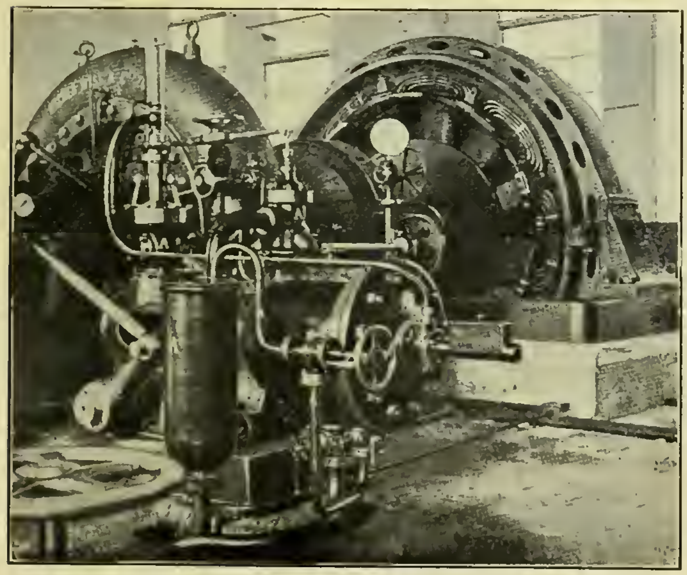


Fig. 3a—Single Turbine and Generator, Tokio, Japan.

This same firm has also received an order from Fort Saskatchewan for a 150 k.w., 6,600 volt Bergmann generator with switchboard and auxiliary equipment. The generator will be driven by a William Hamilton turbine. Also more recently an order from the Gutta Percha & Rubber Manufacturing Company of Toronto for a motor generator set consisting of a 175 h.p., 2,300 volt, 25 cycle motor and a 115 k.w. interpole d.c. generator.

New Books

Standard Handbook for Electrical Engineers—McGraw-Hill Book Company, New York, publishers—Third edition, revised and enlarged; price, $4 net. A handbook written and compiled by a staff of specialists and comprising 20 sections, as follows: Electric circuits, measuring apparatus, properties of materials, magnets, etc., transformers and converters, generators, motors, batteries, transmission, illumination, traction, electro-chemistry, telephony, telegraphy, wiring, standard rules, tables and statistics and miscellaneous applications. Well bound and indexed. A maximum of information in minimum space.

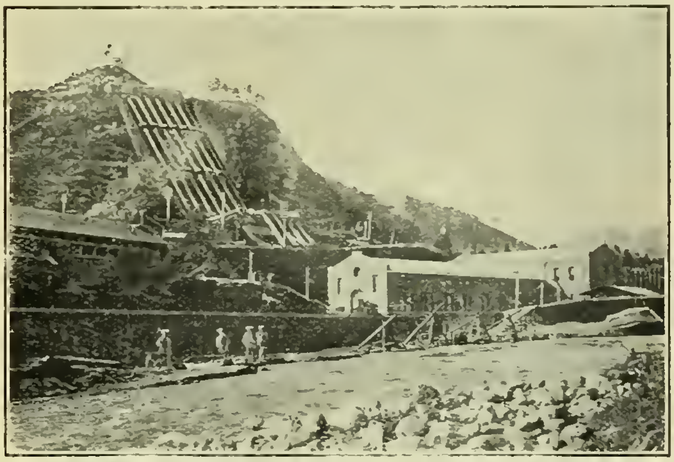


Fig. 4—General Layout of Plant, Tokio, Japan.

Wireless Telephony and How They Work.—By James Erskine-Murray, F.Sc., F.R.S.E., M.I.E.E., etc.; the Norman W. Henley Company, publishers, New York and London. Nine short chapters in which a very successful attempt has been made to show the leading principles underlying this subject. Will be found of value and interest to all wireless students.

The Canadian Independent Telephone Association will hold its annual convention on November 17, in Toronto.

Mr. Frank A. Replogle, representing the Lombard Governor Company, in Eastern Canada and New England, recently called at the office of the Electrical News. He reports an unusual surplus of orders for this season of the year.

Electric Power Development on Bull River

Work of Construction well Under way—30,000 h. p. Available Under a 276 Foot Head—Apparent Market for Full Amount

British Columbia, as a famous visitor has seen fit to remark, is a land of big things—big mountains, big timber, big possibilities, and big undertakings. So many important and ambitious schemes for the development of the province are being initiated that some of those under way are liable to be lost sight of for a time.

This, indeed, has been the fate of the Bull River Electric Power Company's project to develop electrical energy for the industrial upbuilding of the East Kootenay country. Conceived in the canny Scotch brain of Mr. Geo. E. Henderson, of South Dakota, on the occasion of a visit to Bull River Falls some years ago, that gentleman carefully examined the situation, satisfied himself as to the likely demand for power when procurable, and at once secured the development rights. Then he hastened back to South Dakota to interview capitalists and raise the money wherewith to install the flume and necessary machinery. It is unnecessary to dwell upon the disappointments and reverses met with owing to lack of knowledge of the country and the fact that money happened to be "tight" just then. However, those who knew Mr. Henderson had implicit faith in his ability to recognize a good thing, and it was not long before he had at his command sufficient capital to make a start. Some months later a number of his backers visited the scene of operations, and at first glance were appalled by the apparent obstacles to be overcome, but a few days spent on the spot enlightened them as to the wonderful possibilities of the undertaking. Since then Mr. Henderson has had no difficulty in securing all the money necessary, as the Bull River Power Company now has a capitalization of $2,000,000 and very little of the stock is available at any price—it is viewed as representing one of the choicest investments to be found in British Columbia.

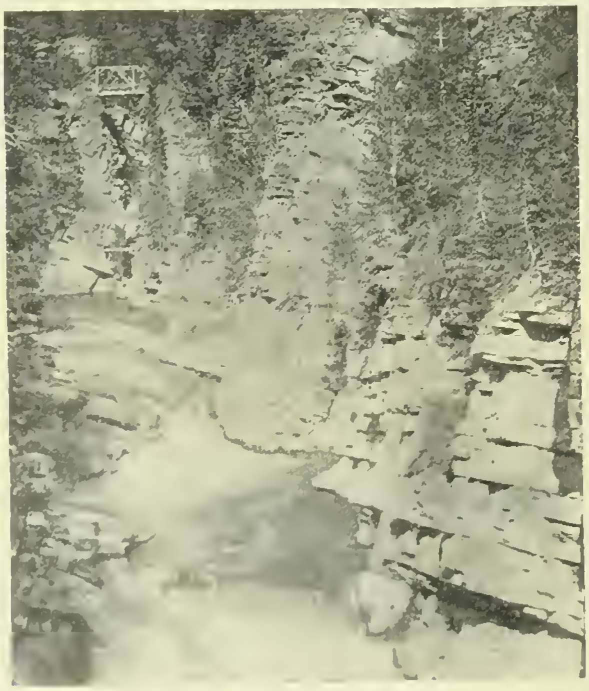


Fig. 1—In Places the Walls of Rock Rise Perpendicular

How Power Will Be Developed.

The power plant will be located at the outlet of Bull River canyon, a gorge which contains probably the most magnificent series of waterfalls in the Kootenays. Here the river rushes through a narrow and tortuous channel, which it has eaten out of the solid rock in the course of countless ages. In places the walls of rock rise perpendicular above the boiling current a hundred feet and more, Fig. I. In its course of less than two miles the river drops more than three hundred feet.

At the head of the canyon a dam 6 feet high, with 2 feet flash-boards, has been constructed and the stream diverted into a substantial wooden flume, Figs. 2 and 3, 16 feet wide in the clear and 7 feet 6 inches deep, made with bents 3 feet 4 inches apart centre to centre, and planked with 2-inch plank at the upper end. The flow of water in the flume is at the rate of 12 feet per second, making the capacity of the flume 1,536 cubic feet, or 48 tons of water per second. This big raceway is 9,200 feet in length, and its outlet is 276 feet above the river. More than 2,000,000 feet of sawn lumber, cut in the company's mill nearby, was used in the construction of the great flume. From its lower end the water will plunge down to the turbines in the power house far below through huge steel tubes, the tremendous energy developed being sufficient to generate 30,000 horsepower.

The construction of the great flume, which has just been completed, entailed a good many engineering problems and the exercise of persistence and faith to a remarkable degree on the part of the manager and his backers. The flume is capable of carrying the full flow of the Bull River from the point of intake, and the dam is so constructed that the entire flow or only part of it may be so diverted. Near the outlet of the flume a spillway (Fig. 4) has been constructed which will permit of the disposal of excess water. The overflow pours down the Rocky Mountain side, constituting a falls 120 feet wide and 260 feet high—a magnificent scenic gem (Fig. 5) that will, in time to come, attract numberless tourists.

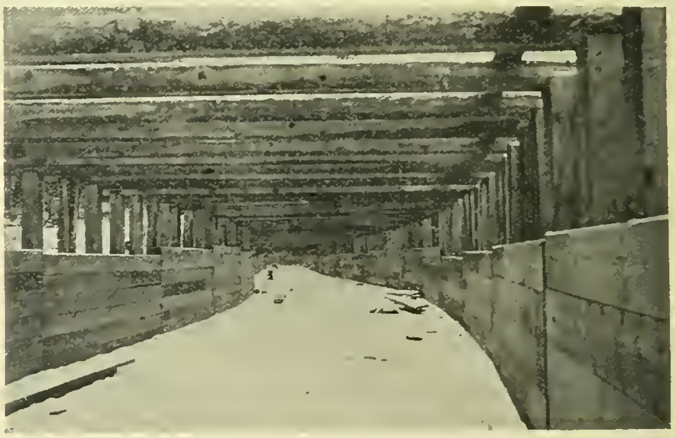


Fig. 2—Wooden Flume 9,200 Feet long

The Power House Equipment.

The work will shortly be commenced on the massive power house designed to receive the generating machinery. The initial equipment will consist of three water-wheels of 4,200 h.p., with two 200 h.p. exciter water wheels, all with the necessary governors, etc.; three 2,500 k.w. generators, 3-phase, 60-cycle; two 100 k.w. direct current generators; nine water-cooled high tension transformers; nine oil-cooled high tension transformers; with the necessary switchboards, etc. The turbines will be direct connected with dynamos of the most modern type. It is expected that this first section of the plant will be in operation about twelve months hence. The other units necessary to develop the full 30,000 h.p. will be added as the demand for power in the surrounding district becomes insistent.

Available Market for Power.

Regarding the disposal of the full quantity of power to be generated, President Geo. E. Henderson is optimistic. He expressed himself as follows to the representative of "The Electrical News:" "We expect to find our chief market for power along the coal mines on the east in the Crow's Nest Pass, out as far as Frank, in Alberta, 42 miles in a straight line east, and at the silver-lead mines around Cranbrook, 18 miles west of us. We have had an engineer go over this territory to sum up the power possibilities, and his report shows that there is now being generated by steam over 20,000 h.p. in units of over 200 h.p. that—given a reasonable price—could be changed to electricity. So far we have made no attempt to secure provisional contracts for power, as we did not think that we were far enough along with our scheme to warrant doing so. We now expect to take that matter up in a short time. Personally I am confident that we can place all the power we can generate with the firms named, as the amount of power required in the coal fields is increasing very rapidly. Considering the convenience of electricity over the present methods used, together with the reasonable price, there should be no hesitancy in making the change."

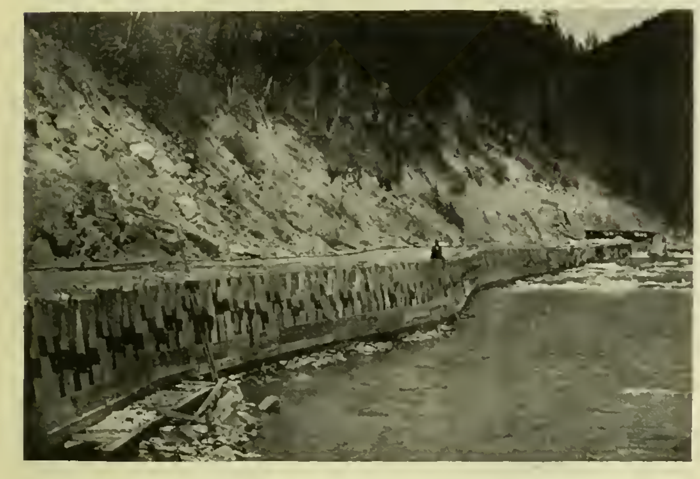


Fig. 3—Wooden Flume Showing Intake.

A glance at the accompanying map (Fig. 6) will show how admirably located is the Bull River Plant to serve the industrial and other needs of the important district within a radius of forty miles. For instance, the busy town of Fernie, with its great coal mines, can be reached with 16 miles of copper wire; Wardner, 13 miles; Cranbrook, 20 miles; and these lines will serve various users of power en route. Mine owners and saw-mill firms throughout the 40-mile radius will be prompt in availing themselves of the new power, and it may be taken for granted that many industries will spring up to serve the needs of the province and the immense prairie market. Already a number of Wisconsin capitalists are planning the establishment of a huge pulp mill at Wardner, to use 10,000 h.p., and schemes for other manufactories are taking shape.

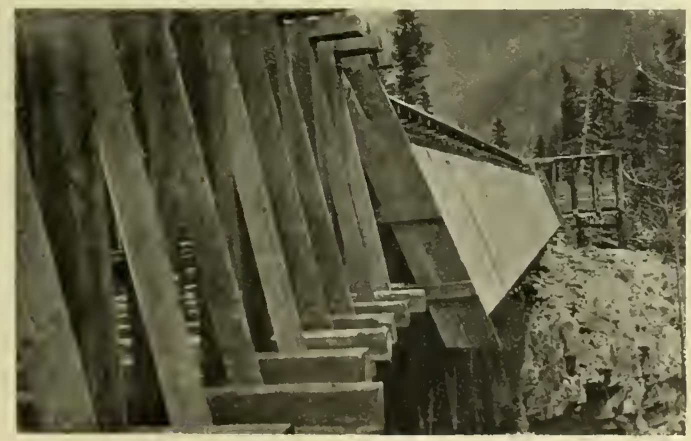


Fig. 4—Spillway to Dispose of Excess Water.

Company Has Mineral Wealth.

Within a stone's throw of the big flume a large dyke of red hematite iron ore cuts through the company's property. This ore has been examined by Pittsburg experts and declared to be a bonanza find. Later on it will be developed, and the possibilities are beyond estimating. This is not all—above the canyon alluvial gold has for years been secured by "panning," and it is not unreasonable to expect that the pot-holes and gravel in the canyon have retained much of the precious metal. During the season of low water, when all of the stream can be carried by the flume, the channel will be carefully worked, and it is confidently expected that the yield of gold will be large.

Fig. 5—Flume Overflow—Magnificent Scenicm G

The Personnel of the Company.

The men comprising the Bull River Power Company have already expended $200,000 on their power project, and face an outlay almost as great before their enterprise can begin to be remunerative. The directors are: Geo. E. Henderson, Wardner, B.C., president and general manager; Chas. A. Heckmaster, Canton, South Dakota, treasurer; D. S. Guinter, Sioux Falls, South Dakota, secretary; Hermon Schulz, Madison, Wisconsin, and Richard Zerbel, Humbird. Wisconsin.

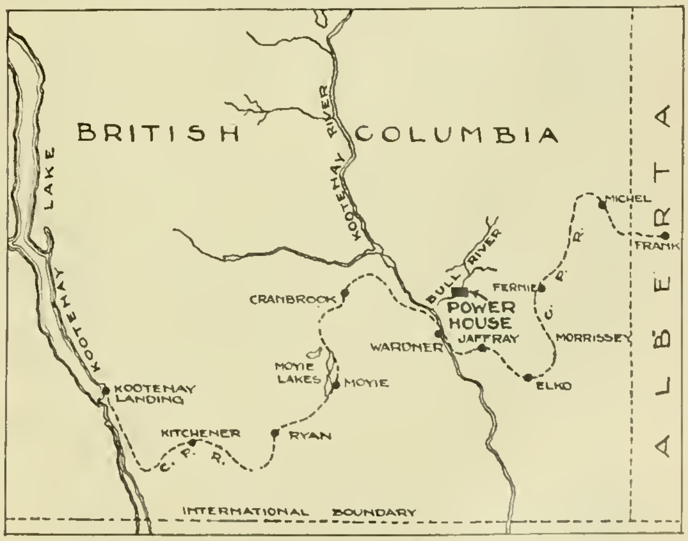


Fig. 6—Map Showing Favorable Central Location of Bull River Power Company's Works.

IN OUT
PLEASE PAY AS YOU ENTER
IN OUT

Calgary Railway Coach—Officials at the Entrance to the Exhibition Grounds

Calgary's Municipal Street Railway

Operated by Paid Commission—Twenty-two Mile Extension in Progress to Cost a Half Million—yearly Contingent Fund of 5% Gross Reserve

In 1906, a company negotiated with the City of Calgary for a street railway franchise, but being unable to come to terms, the company refusing to accept the conditions required by the city, a municipal system was proposed, and $250,000 was voted by the ratepayers, for the construction of such a system, in 1907. Nothing was done until 1908, when three-quarters of a mile of track was laid, during paving operations, in November.

In December of 1908, R. R. Jamieson, formerly general superintendent of the Canadian Pacific Railway, was elected mayor and a paid commission form of government, supplementing the ordinary council, was organized, with Messrs. A. G. Graves and S. J. Clark elected commissioners, and Mayor Jamieson, ex-officio, chairman, and $266,000 more was provided. Tenders were called for sixteen miles of railway material and twelve cars, and it was promised by Mayor Jamieson and the Commission that the railway would operate for the Alberta Provincial Exhibition, July 5th, 1909.

Thos. H. McCauley, formerly general superintendent of the Port Arthur Railway, Light, Telephone & Power Department, was chosen as manager of the system, and assumed the duties of superintendent of construction, April 1st, 1909.

Material was not received until May 1st, when a race against time took place for July 5th, being continually handicapped in deliveries of rails, specials, poles and line materials, and finally the power equipment and rolling stock seemed impossible of delivery in time on account of wash-outs on the railways. The power house generator, however, arrived July 1st, and the work of installing this was rushed night and day. Two cars were received on July 3rd, and at 8 a.m. on July 5th, the opening day of the Exhibition, Mayor Jamieson officially opened the railway, and 35,500 passengers were carried with the two cars during Exhibition week. From that time, construction was continued until the sixteen miles were completed and in operation on November 1st with twelve cars, eleven being operated, so that the entire work was completed, including four miles on paved streets, in six months.

At the end of the year, December 31st, after six months, less five days, operation, 1,275,028 passengers had been carried, resulting in a revenue of $57,505.68, and a profit over operating expenses of $21,491.17, which, after deducting interest and fixed charges, left a net balance of $10,001.37.

For 1910, Mayor Jamieson was re-elected by acclamation as mayor and chairman of the city commissioners. Six additional cars were ordered—46 feet long—three from the Preston and three from the Ottawa Car Companies, from the surplus saved under the original by-law, and Superintendent McCauley continued as manager, with the following results for the eight months ending August 31st, 1910: The month of July alone netting a revenue of $23,474.15, with a surplus over operating expenses of $14,030.59, or 40.2 per cent operating expenses and 59.8 per cent. profit, from which $2,715.88 monthly interest and sinking fund being deducted, left a balance, net, of $11,314.71 for that month.

However, Calgary does not propose to operate other than on sound business lines and has established a contingent fund of 5 per cent. of the gross revenue, in addition to the sinking fund and interest account.

Coach used on Calgary Municipal Railway—Manufactured by Preston Coach and Car Co.—In Car from Right to Left Sup't McCauley, Mayor Jamieson, Commissioners Graves and Clark

The detailed figures for the eight months of this year, to August 31st, 1910, are as follows:

Earnings		$131,105.81
Operating Expenses—		
Maintenance way and structures	$ 4,261.77	
Maintenance equipment	7,194.63	
Transportation and operation...	52,414.68	
General expense	4,604.15	
	$68,475.23	
Other Deductions—		
8 months' interest at 4½%....	$15,480.00	
8 months' sinking fund........	6,247.04	
5% gross revenue (contingent)..	6,555.29	
Balance (net profit)	34,348.25	
	$131,105.81	$131,105.81

After all the above-mentioned deductions are made, it is expected, that the net profits for the year, will exceed $45,000, or sufficient to reduce the tax rate one and a half mills on the dollar, Calgary's assessment being $3,000,000.

A Street Scene in Busy Calgary

In this way the shareholders benefit according to their interest in the city; anyone asesssed for $500,000 will receive a reduction of one and a half mills, or $750, in taxes; a man assessed for $100,000 will receive $150; one for $10,000, $15, etc., as dividends.

The system now comprises 16½ miles of track—4 miles paved and 12½ miles graded streets—constructed of 60 and 80-lb., 60-foot, Lorain section, 6 and 7-inch high T rails, with standard switch and intersection construction, having solid manganese tongues and centres, supplied by the United States Steel Corporation and Montreal Steel Works.

On paved sections, the 6-inch and 7-inch fir ties are laid on a sub-base of 4 inches of concrete, and grouted in to within 4 inches of the top of rail on wood block sections, and to the top of the rail on granitoid paved sections, making a solid bed of 17 inches of concrete.

All joints are double bonded with O. B. Company's compressed plug bond, equal to 4/0 copper.

The overhead is constructed on steel poles throughout the business section, and cedar poles, set in concrete, at other points. Round 2/0 copper trolley and insulated aluminum cable feeders, equal to 250,000 circular mils, constitutes the construction. Six circuits leave the power house to separate sections of the line, which is separated by breaks, controlled by switch attendant should trouble occur on any section, all of which is maintained by an automobile tower wagon.

The equipment consists of 18 pay-as-you-enter cars, built by the Ottawa and Preston Car Companies, of the single-end coach type, 41 and 46 feet long—the large cars having polished bronze P. A. Y. E. railings and bevel plate bulkhead and door sash; Westinghouse and General Electric air and Peacock brakes; Providence fenders, and Root scrapers. Cars have Brill trucks and Consolidated Electric heaters, supplied by Dawson & Company, with sand boxes, electric bells and coach seats. They are equipped with Coleman standard P. A. Y. E. fare boxes, and all modern fixtures to make the equipment complete and up-to-date. The car barn is solid brick, 60 x 190 feet, fitted with steam heat and repair shop.

One 5,000-gallon centrifugal street sprinkler is operated by the street railway department, without cost to the city, for the purpose of keeping down the dust and watering the track.

Three routes are now operated, on 6, 8 and 10-minute schedules: the signs being illuminated from all sides of the cars, red, white, and blue, respectively—a red square, running east and west; a white diamond, north and south, and a circle blue, Belt Line. These are interchangeable to any car.

The organization of the system is represented by the city commissioners, as directors of the railway, electric light plant, power station, waterworks, and all construction, maintenance and management of the general work of the city. The railway pays the power department for what it uses at the rate of 2½ cents per kilowatt hour, and has its own offices, accountants and clerks, where all tickets are sold and accounts kept, the revenue being turned into the city treasurer daily, who, in turn, pays all accounts, when approved, including the fixed charges. The manager has full control of the department, reporting to the commissioners, assisted by a general foreman, traffic inspector and chief accountant. Employees are engaged on the merit only and dismissed if found incompetent without any influence being considered, as is usual in municipal operations.

No labor organization is recognized in agreement for engagement, and all conductors and motormen are made district constables, so that they may maintain order on the cars if necessary. The salaries paid are 25 cents per hour for the first year and 27 cents per hour for the second year's service.

During the first year's operation, carrying 3,329,697 fare passengers, only one slight accident occurred, costing the railway $15.00, aside from vehicle damages of a small amount.

The system has been so successful that the ratepayers have voted $484,000 for additional car equipment and 22 miles of extensions to be constructed in 1911, the material for which tenders are now being called for delivery in the spring, when, it is expected, the Calgary railway will rate seventh in Canada.

The city is centrally situated and a wholesale and manufacturing centre of that vast country between Winnipeg and Vancouver. It has a population of over 40,000, with 125 wholesale houses, 40 factories and 5,000 hydraulic horse power, now about ready for delivery by the Calgary Power & Transmission Company, from which the railway will receive a reduction in its power cost of one-half that which steam power is now supplied at. The population has increased 15,000 during the past eighteen months. In August Calgary was sixth in the bank clearings in Canada, and is probably destined to be the fifth city in five years, with the C. N. R., G. T. P. and the Butte Montana Railway now applying for an entrance.

The present power department is operated under Mr. J. F. McCall, superintendent. The apparatus consisted of a 300 k.w. Bullock motor-generator to start with. In September a 600 k.w. Bullock generator was installed, direct connected to a 1,200 h.p. Robb-Armstrong marine type engine, and a capacity of 1,200 h.p. in Babcock and Wilcock boilers installed. A further addition is being now made to this by an additional unit of the same capacity.

These will be used as auxiliaries when power, which is now contracted for with the Calgary Power Company, is delivered about January 1st, 1911.

Mr. John F. Argue, divisional superintendent for the Toronto Street Railway Company, died recently at his home, 329 Pape avenue.

Calgary's Municipal Superintendent

The superintendent of Calgary's municipal street railway system, Mr. Thomas H. McCauley, is a young man who has accomplished much. At sixteen years of age he began with the Bell Telephone Company in Port Arthur and Fort William, and within two years, by hard work and study, had become local manager. About the same time he opened up an electrical contracting business and built a portion of the new street railway. In 1893, along with his telephone duties, he became secretary and electrician to the Port Arthur Electric Light Company. In 1894, when the business of the Port Arthur Street Railway was being carried on at a heavy loss, Mr. McCauley was able to add to his other duties that of superintendent of this system, and was so successful as to be able to turn a deficit into a goodly profit for the city. During this time also, the electric light plant was rebuilt, and a water power plant constructed. In 1901, owing to disagreements between the Bell Telephone Company and the Twin Cities, Port Arthur decided to install a municipal telephone system, and Mr. McCauley now became general superintendent of the Port Arthur Railway, Light, Power & Telephone Companies. In 1908, by arbitration through the Ontario Railway Board, Fort William assumed a half interest in the street railway, and Mr. McCauley resigned from the railway work, giving his whole time to the interests of the city of Port Arthur in the light, telephone and power departments. This position he finally resigned in March, 1909, to undertake the management of Calgary's infant street railway enterprise with the happy results set forth in the previous pages.

Mr. Thomas H. McCauley

Mr. McCauley is exceedingly proud of his system in Calgary and is a firm believer in municipal operations, but is, nevertheless, very outspoken in his belief that much good work, on the part of electrical operators, is often spoiled by inexperienced and irresponsible aldermanic interference. His motto is "proper business methods will bring success to municipal enterprises." Mr. McCauley is a member of the Canadian Electrical Association and associate member of the American Institute of Electrical Engineers.

Mr. A. L. Woolf, special representative of the Canadian Tungsten Lamp Company, is at present in Vancouver, and reports that the electrical trade throughout the West is showing a most wonderful expansion, practically every town being at the present time users of electrical current.

Personal

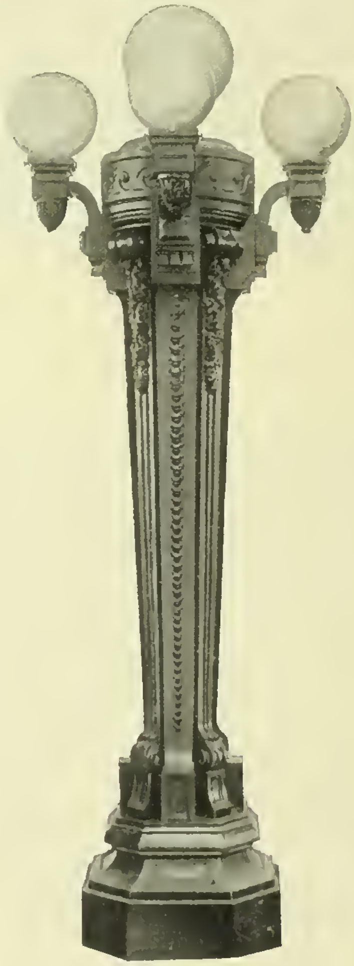
Mr. David Irving, travelling salesman for Chapman & Walker, Limited, was married on the 5th inst. and is spending his honeymoon in New York.

Mr. F. B. Smith, manager of Western Union Telegraph Company's business in St. John, is severing his connection with that company. It is expected Mr. P. J. O'Rourke, of the Great Northwestern Company, at Toronto, will succeed Mr. Smith.

Mr. R. J. Clark, for the past six years Assistant Comptroller of the Toronto Railway and Comptroller of the Toronto & York Radial Railway, has been appointed comptroller of the Kansas City Electric Street Railway, Power & Light Company. Mr. Clark has had a varied and extensive experience with the Toronto Railway, the National Trust Company and the Sao Paulo Company. He is a son of Mr. L. J. Clark, 104 Avenue road.

Lamps for Union Station, Winnipeg

The accompanying figure represents one of the half-dozen iron lamp standards with which the Union Station at Winnipeg is being equipped. These standards were designed by the firm of Warren & Wetmore, architects, New York, and manufactured by the Canada Foundry Company, Toronto. Each standard weighs about 1,400 pounds and, including globe, measures 10 feet 6 1-2 inches in height.


Lamps for Union Station, Winnipeg

Wise to Cultivate Residential Lighting

Interesting Paper before the C.E.A. Convention—The Small User not Necessarily Unprofitable—Mr. Holbrook explains his Check-meter—The Full Text of the Discussion

A paper presented by Mr. A. T. Holbrook, of New York, before the recent Canadian Electrical Association, dealt with the subject, "The Residential Lighting Feld, and How It Can Be Profitably Cultivated." The subject matter was synopsized in our August issue. The discussion on the subject matter of the paper was full of interest and is as follows:

Mr. Mudge.—May I ask Mr. Holbrook if he will give us some description of the check meter used in connection with the system he describes.

M. Holbrook.—The instrument used under those circumstances is designed for the purpose of limiting the demand in the ordinary way by flashing the lamps when the amount of current contracted for has been exceeded. This is accomplished electrically by the operation of a pair of solenoids, one a series and one a shunt, one with a stationary and one with a moveable core connected with the main switch. The series coil when overloaded closes the shunt circuit, which opens the main line. The whole instrument is immersed in oil, and all the contacts are made and broken in that liquid. The adjustment of the instrument is made by increasing or decreasing the tension of a current carrying spring, which, when the current is increased beyond the amount the instrument is set for is attracted by series coil, above referred to, to a position where it closes the shunt circuit and opens the main line. That operation is conduitenET circuit and opens the main line. That operation is continued as long as the overload is kept up. I may say in connection with this, that the instrument is, of course, merely incidental to the method of selling of current advocated, but it happens that the instrument as designed and put out is without maintenance expense, has no variations in operation, and simply acts as a check on the customer without any attention on he part of the central station.

Mr. Mudge.—How does the cost of it compare with the cost of the ordinary type of integrating meter.

Mr. Holbrook.—About the same.

Mr. Littlefield.—Where does Mr. Holbrook get his authority for saying that less than 10 per cent. of the residences are connected to the central stations where the houses are wired?

Mr. Holbrook.—In the "Electrical World" of February 3rd that matter is commented on editorially and is referred to as a matter of reproach. I thought I had the "World" here that has that reference, but I know that Mr. Weaver has compiled a great many figures on that subject and when the new census is completed it will be again referred to.

Mr. Littlefield.—Does Mr. Holbrook mean that as 10 per cent. of the houses wired and adapted for the use of electric service, or 10 per cent. of all the houses, taking those that are wired and those that are not wired?

Mr. Holbrook.—That means that out of all the houses located on central station lines in towns where lighting plants are located. These are houses which can use the electric light, but do not for various reasons. The light companies could serve these customers with ordinary expenses but do not.

Mr. Littlefield.—Are the houses themselves wired?

Mr. Holbrook.—Not all; in fact, only a small proportion are wired.

Mr. Littlefield.—That is different.

Mr. Dion.—I would like to ask a question. This matter of selling current off a limiting device is not altogether new, and the objections that have been raised to it have been, first, the unreliability of the controller used, that is, the inability to adjust it within a narrow enough limit to do the company justice, and secondly the difficulty of allowing the customer to temporarily use more than his demand. It is difficult to tie a customer down to a maximum that will be his ordinary every day maximum, and not allow him on occasions such as when he is entertaining, to use more. I would like to ask how this is provided for in Hartford. Mr. Holbrook has already answered about the reliability of the instrument and I am glad to hear there is an instrument that is reliable, but I would like to hear on the other point.

Mr. Holbrook.—It happens that there are about forty stations in the United States that have adopted this method of selling current. They adopted it primarily to get new business. They have realized that they have very little lighting business, as far as residences are concerned. As a matter of absolute fact, if you analyze the situation, you will find that the residence lighting business of the lighting company is very small. All of the stations that are using the current limiting device or excess indicator do so on a class of business that is represented by a maximum demand of from 187 to 200 watts. Those customers are limited to that amount of course, but the companies have established a charge that they make, and they offer it in conjunction with the installation of the indicator, that periodically on notice the indicator will be disconnected. The usual charge is 50 cents. They charge 50 cents to go down to the customer's house and disconnect the indicator for that evening, and re-connect it the next morning. They figure that the 50-cent charge is sufficient to prevent that being done very often, and is a sufficient revenue to cover the expenses of making the adjustment. It happens that in Hartford out of a list of in the neighborhood of 2,000 installations that less than one-half of one per cent. of the total number of residences connected called upon the lighting company to make that re-adjustment. It must be remembered that this business comes from what is now known as the poorer class of business, which the average lighting company does not feel worth while going after. The man that gets $15 or $20 a week does not entertain very much, and that is the class of business that this rate applies to, and a lot of the incidental expenses of solicitation, maintenance and operation are reduced to the minimum, so that a customer may get the benefit in light, and the company get the benefit in earnings.

Mr. Black.—In the early days of the electric light business the flat rate method of charging, that is, so much per lamp of 16-candle power, was almost universally used. It was finally superseded by an almost universal straight kilowatt hour rate, the reason being it was found very, very difficult to have the customer merely use the light when he wanted it. The lamps were comparatively cheap, and the customer would burn the light twenty-four hours a day. That brought about the desirability of using the kilowatt hour method of charging. Now that the high efficiency lamp has come on the market and is daily being improved it would look as if we would have to go back to some other method of charging in order to be able to get a fair return on the capital which the electric light companies have invested, and whether the two rate system will satisfy the condition that exists, which is the new condition of the public mind, I can not say, but it would seem to me that with this current limiting device a field which has heretofore been practically left undeveloped can be made very profitable. I refer to the small houses where they do not do very much entertaining and where they merely want light. With the small sized efficiency tungsten lamp, which has a greater cost than the carbon lamp, a great deal of light can be given for a given amount of money, and a great deal of satisfaction can be given if you have a limited maximum demand. The higher price of the tungsten lamps, I think, will prevent a customer burning them more than is absolutely needed, because he can be educated to the point where he can see it is desirable from his point of view, as well as the company's, to shut off his light when he does not need it. It seems to me with the current limiting devices which are now on the market, and which I understand are very much better than the ones used some years ago, that a very profitable line of business can be worked up. One of the big drawbacks to the first current limiting devices which were on the market was the drop at full load, these being used largely with carbon lamps, but if some system were adopted for small house lighting in large cities, and perhaps all house lighting in the ordinary town throughout Canada, a very high return per kilowatt of maximum demand can be obtained. For instance, if you made a charge of say 50 cents per month per ampere, that would be for two amperes maximum demand, there would be a charge of one dollar per month, or $12 a year. Now, a man could burn 200 watts, or have ten 18-watt tungsten lamps going at one time and still have a little margin. That will give very satisfactory light in a small house where he can have 25 lamps installed if need be. That will give a return per kilowatt of maximum demand of about $60 per year, and with a diversity factor of two, (giving these figures off-hand), $120 per kilowatt of maximum demand, or kilowatt of connected load. This is a very, very high return, and I think a very profitable line of business can be developed which has hitherto been untouched. This might be used as one form of contract, the limiting device in conjunction with the current meter, where a very low rate per kilowatt was charged, together with the limiting device to suit another class of customer, and then for other classes of customers some other form of charging, which might involve a three rate method of charging. It seems to me to fill all the conditions which are required. On a large lighting system you have got to have a number of different systems of charging.

Mr. Eugene Creed.—I would like to ask Mr. Holbrook what method is adopted where irons and toasters are used. What does Mr. Dunham use?

Mr. Holbrook.—It happens that Mr. Dunham makes a separate flat rate charge on those devices and connects them back of the indicators, reserving the indicator for lighting only. In other stations they connect the cooking and heating utensils on the indicator itself and make a lower charge for the current consumed by the flatirons and so forth, than they do for light, on the same basis as was referred to this afternoon as to lighting being more important. It strikes me we have come to a position where the manufacturers of heating and cooking utensils have got to catch up with lamp manufacturers. That is, the income from flatirons, and toasters, and coffee percolators, and one thing and another, as compared with the income per watt of maximum demand from current used for light is not proportionate, and it seems to me that the manufacturers of heating utensils must improve their apparatus, and offer to the lighting companies a more efficient line of articles that will enable them to get relatively as high a rate of annual income from the maximum demand as they do from lamps.

Mr. Robins.—In regard to Mr. Holbrook's system, there is one point which he alluded to slightly, but it strikes me it is deserving of a little more notice. His system would act as the entering wedge for a class of business that hitherto it has been impossible to get. I happen to have recently visited a town where his system has been in use, and I was informed that a very respectable percentage of the new business which had been got by his instrument had been converted to a meter basis on a differential rate later on. People had never had electricity in their houses because they were afraid of it. When they had got a taste of what it was, through a limited contract, they began to look further into its advantages, and found there were a great many other ways it could be used. They couldn't afford, however, to pay for a sufficient maximum to carry the heating devices, and they wanted to know how it could be fixed. The company said, take it on the meter basis and we will arrange the rate so that your excess consumption in proportion to the size of your light installation will not be at the full rate. It would seem that Mr. Holbrook's system is the entering wedge which can be made to bring in a great deal of new business to a company.

I should imagine that the limiting of the maximum demand would also solve or get rid of the necessity for the arbitrary methods of rating for capacity. The arbitrary methods are nearly all liable to be unjust. If you examine almost any of them you will find there are exemptions which apply to large houses and installations which do not apply to small houses, and the result is you get the criticism that the big house is getting a great many exemptions that the small house does not get. Unfortunately there are a great many men just now ready to pick up such defects and make trouble out of them. I think Mr. Pack's suggestion of getting the public service commissions to make a study of the true cost of electric service is really one of the best that has been made this afternoon. I fancy Mr. Holbrook's instrument, if it doesn't do anything else, will act as an entering wedge in a great many cases.

Mr. I. H. Wright (North Bay).—It would seem to me the purpose of this instrument is to obtain a class of business that we have never been able to reach, and that class of business represents those whose incomes are limited, as the paper says, from $600 to $1,000. There is, however, a little difficulty here, it seems to me, in the system of collecting. Is there not likely to be more difficulty than with the ordinary customer whose income is larger? I would like to get an expression from Mr. Holbrook on this particular point.

Mr. Holbrook.—In Colorado, one lighting company is working among a lot of coal miners. They have just made contracts with ninety coal miners to put in a system of a combination of excess indicators and tungsten lamps, and the light company has sold them current at one cent per watt per month. The arrangement was made with the coal company that the amount of the light bill should be deducted from the wages of the coal miners weekly and turned over to the lighting company. In a number of places elsewhere the rate for lighting is made on a weekly basis and collected in advance. In other places it is made monthly and collected in advance, but it represents such a small amount of money it is just as easy to collect it in advance as it is in arrears. It is purely a matter of how the thing is put forward whether it shall be collected in advance or not.

Mr. Fleming.—I have not given the subject of rates very much thought, only in so far as I think they should not be discriminative. I think though that Mr. Holbrook's device does open up a field with a poorer class of people, and this would apply to cities the size of Toronto and Hamilton, where you have small commercial centres, small grocery stores, small butcher shops, and so on, where they are nearly always gas users. They have considered gas a cheap illuminant, but I am satisfied if they had a fixed rate with a high efficiency lamp you could win them over and do away with the gas. I have often wondered why central stations did not make a special rate to a small long burning hour customer. I think some limiting device given with a high efficiency lamp would meet their demand, but that, like everything else, somebody will have to get behind it and push to see what there is in it.

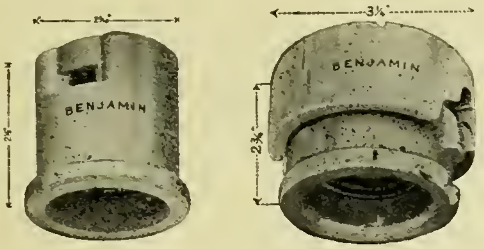
Victory for Charters' Act

The first case under the new Charters' telephone Act passed last session has been tested before the Ontario Railway & Municipal Board. The Brussels, Morris & Grey Telephone Company offered connections to the Wroxeter Independent Company which the latter were unable to accept owing to a prior agreement with the Bell Company preventing connection with any other company. The chairman of the Board stated that in the face of the present law such an agreement was void and gave the two Independent companies ten days to make amicable arrangements.

NEW APPARATUS

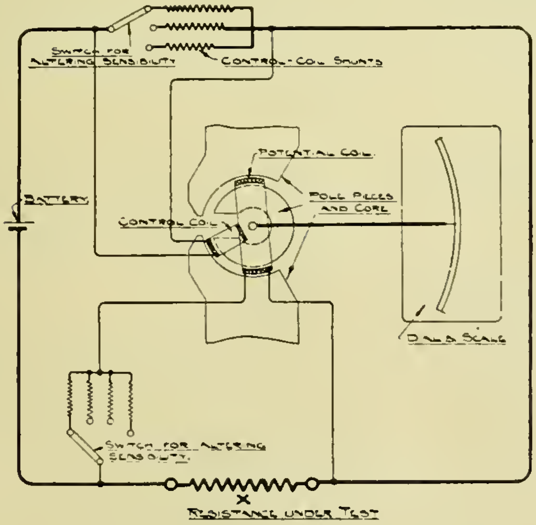
New Sockets for Large Screw Base

The accompanying cuts show two new sockets now being placed on the market by the Benjamin Electric Manufacturing Company of Chicago. They are intended for use with lamps having large screw base (Edison No. 41), and are adapted for attaching to a surface or bracket by means of screws passing through the base. The screw holes in No. 69 are spaced 1-5/32 inches apart; in No. 79, 1-3/4 inches apart. No. 69 is a one-piece socket intended for use on low voltage circuit not requiring cut-out or short-circuiting mechanism. It has spring centre contact, wires lead in the sides, and the binding screws are accessible from the central opening. It may be ordered with steel yoke tapped for 3/8 inch iron pipe to be used with fixture where desired. No. 79 is a two-piece series cut-out socket with short circuiting centre contact for high voltage street lighting circuits. It has side connections and will receive wires as large as No. 6. The latter are firmly held by clamping plates.



"Evershed's Ducter"

This is another special type of portable instrument devised for the rapid measurement of resistances of all kinds by persons unskilled in technical matters. It is manufactured by Evershed & Vignoles, London, Eng., and sold in Canada by Vandeleur & nichols, Toronto.



Showing Principle of Evershed's Ducter

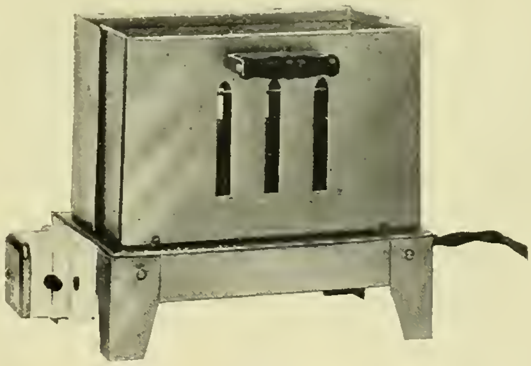
The Megger dealt with resistances within the limits of about 1000 ohms to 2000 megohms. The Bridge-Megger enabled rapid measurements to be made from about 1/10th of an ohm to 40 megohms. The "Ducter" now provides means of measuring with great rapidity and convenience any resistance between .00001 ohm and 5 ohms. It is, therefore, particularly adapted for measuring the resistance of rail bonds, armature coils and the like, and is specially useful for testing the working of switches and other rubbing contacts, and joints of all kinds. It also enables bad contacts of all kinds to be quickly located; and in this way puts a new and important tool in the hands of the manufacturer.

In principle it is quite simple. Two coils, mechanically coupled together with their planes at an angle of about sixty degrees, move in the air-gap of a magnetic circuit of peculiar design. One of these, corresponding to the pressure coil in a Megger, is used as a control coil, and is shunted on a resistance contained in the "Ducter." The second coil, corresponding to the current coil in a Megger, but in this instance known as the potential coil, is shunted across the resistance to be measured. Current from a battery provided with the instrument is passed through the resistance to be measured and that contained in the "Ducter," in series, as shown in the diagram; and the moving coils indicate by the position of their index on the dial the resistance under test.

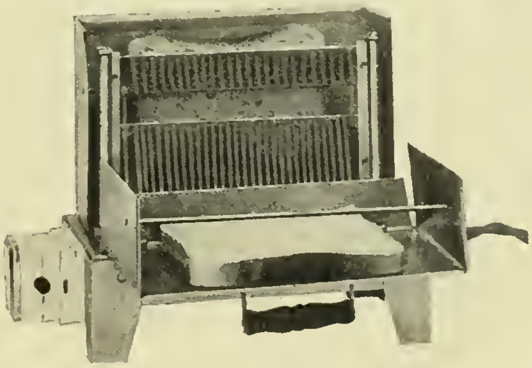
Means are provided for altering the sensibility by varying the resistance of the control coil shunt, and by altering the resistance in series with the potential coil; so that a direct indication of resistance is secured over a range extending from 10 microhms to 5 ohms. In this way the indications of a "Ducter" overlap those of a Bridge-Megger.

New Electric Toaster

Something entirely new in electric toasters is being offered by the Radiant Electric & Manufacturing Company of Toronto. This double toaster is closed on both sides so the bread will be thoroughly dried and no heat wasted. Any steam that may form is allowed to pass off through the open top. These toasters are finished in nickel and copper and operated by a handsome switch. The heating element is easily accessible and can be replaced when necessary.



Toaster with Sides Closed



Toaster with One Side Down

Current News and Notes

Allandale, Ont.

The Grand Trunk Railway System have recently placed in commission on their Northern division, two telephone train dispatching circuits. One circuit is between North Parkdale Junction and Burlington Junction, via Allandale, a distance of 145 miles, and the other between Allandale and Nipissing Junction, a distance of 165 miles. Train dispatchers on each of these circuits are located at Allandale.

Brandon, Man.

Extensive operations have been started by the Manitoba Telephone department in the construction of an underground conduit system. Two miles of wires will be placed underground before winter.

Several of Brandon's big business blocks are now furnished with heat by the Electric Light Company's heating system from the central station. The laying of mains for this system is completed, and connections with the different blocks in the district covered by the system are now being made. The heating plants in about a dozen of the big buildings have been connected up with the new system, which worked splendidly in the first test.

Professor Herdt's report on the development proposition of the E. B. Reese Company at the Mather dam, near Kenora, to supply this city with power is conclusively adverse. The report states that there would not be more than 15,000 h.p. at low water, which considering the distance power would have to be transmitted, 265 miles, could not be made to play operating expenses even if all delivered to one customer.

Barrie, Ont.

The solicitor for the Monarch Railway has written that the company is ready to start to build as soon as the council settles the franchise.

Berlin, Ont.

At the meeting called to discuss the question of securing natural gas for towns and cities in northern section of Western Ontario, Mr. G. H. Clarke, secretary of the Berlin Light Commission was appointed permanent secretary of the Union to keep in touch with the conditions of the natural gas fields and keep municipalities informed.

Belleville, Ont.

At the last meeting of council the offer of the Canada Company for a switchboard panel, three meter receptacles and one meter plug to be installed for $60, was accepted and the tender of the Allis-Chalmers Company for a Venturi meter installed complete for $1,000 was also accepted.

Brockville, Ont.

There is a report that the Long Sault Development Company will commence operations, on the United States side of the St. Lawrence, on a dam to be constructed between the Long Sault Island and the main land. It is also said the Ontario & St. Lawrence Power Company will develop power at Waddington, New York State, and supply the Ontario Hydro-Electric Commission with 15,000 h.p. for distribution in Eastern Ontario. Morrisburg has been quoted $17 for 2,000 h.p., and Prescott $23 for 1,000 h.p.

Charlottetown, P.E.I.

Offers have been received from the Bell Telephone Company of Canada and the Maritime Telegraph and Telephone Company for the purchase of the stock of the P.E.I. Telephone Company.

Calgary, Alta.

Tenders are being called until November 7th by the City Commissioners for supply of equipment, rails, cars and overhead material for extensions to municipal street railway. W. D. Spence, city clerk.

City Engineer Child has returned from a trip of inspection to the power site on the Elbow river, where the city has made application for the right to develop power. His report is favorable to its development for power.

The city electric light department reported 205 new connections made last month, with 63 renewals and 57 cut-outs. The gain was 211.

The electrical workers in the employ of the city threaten to strike unless the daily wage is raised from $3.50 to $4. The commissioners are taking two weeks to consider the matter.

The city council accepted the offer of R. S. Blome Company to lay the railway ties and rails ready for the paving of Albert street from Dewdney street to 11th avenue, through the subway at actual cost, plus 15 per cent., and to place the extra concrete required at $8.50 per cubic yard.

Three tenders for supply of 20 motors for the six new cars on the street railway were received and were as follows: Westinghouse, $10,950; General Electric, $10,450; Allis-Chalmers-Bullock, $11,166. Although the tender of the General Electric Company was lower than that of the Westinghouse by $25 a motor, the latter was accepted because the cars at present are fitted with Westinghouse motors. The new cars which are to be ordered will not be fitted up for the Westinghouse motor as those that have been purchased have been. Other companies will thus be on the same footing with the Westinghouse.

Duncan, B.C.

A by-law was submitted October 8th asking power to give the Duncan Power & Development Company a 10 year exclusive contract for supplying light within a radius of three miles of the post office. Carried.

Edmonton, Alta.

The Municipal Telephone Department will have a surplus of $6,000 this year according to Superintendent Griffiths. The system has been giving some trouble and the installing company, the Automatic Electric Company, of Chicago, has sent an expert to investigate.

City Engineer Latornel's estimate of the expenditure on street railway construction for the present year amounts to $119,480.46. The estimate is for track work alone.

The city will apparently not acquire its projected water rights on the Athabasca without a fight. The city's representative, John S. Fielding, who was sent north a short time ago to investigate power possibilities, found a notice nailed to a stake at Grand Rapids, stating that all water rights had been taken, signed, A. Violette. A. Violette apparently represented American capital. A struggle for possession will probably follow.

The present indications are that last year's deficit of $16,571.22 on the operation of the electric light and power department will be wiped out this year, and a substantial surplus provided in addition. For the ten months ending August 31st, the surplus is $13,452.27, representing an expenditure of $117,656.20, and a revenue of $131,108.47. The estimated surplus for the year is $15,000, but this will probably be exceeded.

Estevan, Sask.

The tender of the Robb Engineering Company of $8,579 for one Cross compound engine, with complete equipment, erected in Estevan, was accepted. The tender of the Canadian Westinghouse Company, of $5,083 for one 125 k.w. electric generator, switchboard, switchboard instruments, wiring inside power house, transformers, and arc light equipment as per specification of engineer, all erected in Estevan, was accepted. The tender of McKenzie & Prevost of $9,205 for the power house, was accepted.

Fernie, B.C.

Mr. McDougall proposes to develop the water power on Fairy creek to supply electric power to the town. The actual cost per horse power under existing conditions, using steam, is about $70.

Fort William, Ont.

The surveys for the Rainy River Radial Railway have been made and some plans completed. It is understood that construction may start in the spring.

This city will install special ornamental electric light and trolley poles at intervals of about 50 feet, in Victoria avenue on both sides, from Simpson street to Syndicate avenue. There is to be a cluster of four lights at a height of about 12 feet on each pole, which is to be prolonged sufficiently to support the trolley wires. The agreement between the property owners and the city provides that the property owners shall pay for the ornamental poles and that the city shall place the poles in position, establish electrical connections and supply the electricity to be used in the illumination.

Granby, Que.

Mr. S. H. C. Miner, of the Miner Rubber Works, has installed two new 70-inch Peterboro turbines calculated to develop 250 h.p. They are gear connected to the generators.

Guelph, Ont.

Mr. W. A. Bugg, the secretary of the People's Railway Company, states that now the franchise has been granted by this city the work of grading will begin at once between here and New Germany. He states that the grading between New Germany and Bridgeport is completed. The money by-law, which also carried, authorizes the city to subscribe to $85,000 worth of the preference stock in the railway company.

The plans of the Peoples' Railway Company have been furthered very materially by the passing of the by-laws in Guelph. The plan of the main line now runs from Stratford to Guelph through Berlin and New Hamburg. Branch lines will be run to Arthur, Puslinch lake, Hespeler, Baden, Ayr, New Dundee, and Woodstock. At the next session of the Legislature a charter will be sought to allow the company to build to Goderich, to London, and to Toronto. The main line of the railway will then run from Goderich to London, to

Stratford, to Berlin and Guelph, making a round run of five hours' duration.

Halifax, N.S.

The report that communication had been established between the Glace Bay Marconi station and that at Buenos Ayres, Argentina, is corroborated by Manager Whitemore of Glace Bay station. Messages were sent from Glace Bay to Buenos Ayres between Sept. 8 and Sept. 24, and were successfully received by the Marconi station. None were received at Glace Bay from Argentina.

Kingston, Ont.

The Hydro-Electric Power Commission is endeavoring to secure power from companies in the eastern portion of the province for a number of municipalities who have applied for it. The following municipalities have asked for estimates of the prices they will have to pay for electric energy: Kingston, 2,500 h.p.; Deseronto, 300 h.p.; Belleville, 3,200 h.p.; Brockville, 500 to 1,000 h.p.; Oshawa, 500 h.p.; Cobourg, 800 h.p.; Bowmanville, 600 h.p.; Picton, 500 h.p.; Durham, 2,000 h.p.

London, Ont.

It is said the proposed London to Sarnia electric railway, for which ex-Ald. Stewart holds the charter, will be constructed by an English syndicate.

Manager Dark is authority for the statement, referring to London's new street lighting system, that there is every surety that the street lighting, including the down town ornamental system, will be ready by December 1, when the contract with the London Electric expires.

The meeting of delegates, representing municipalities interested in Niagara Power, which met in London Sept. 22, passed a unanimous resolution to the effect that the export of 15,000 h.p. by Windsor be allowed on condition that all the municipalities shall receive their share of the advantages and profits. Mr. Adam Beck stated that the Commission would be guided by the resolution, but that if such export were allowed it would certainly only be on condition that it be subject to recall at one year's notice. If Windsor takes 20,000 h.p. the price is calculated at $25.

Melville, Sask.

E. J. Winger, electrical engineer, of Montreal, offers to build electric light and steam heating plant here.

Medicine Hat, Alta.

The following tenders for two direct connected gas engine driven 125 k.w. alternating current units for the power plant were received: E. Leonard & Sons, engines, $13,974, generators $11,100; Kilmer, Pullen & Burnham (1) engines $14,500, generators $8,776, (2) engines $17,500, generators $8,776; Siemens Bros., (1) engines $14,005, generators $4,255, (2) engines $17,500,. generators $4,255; Allis-Chalmers-Bullock, Limited, engines and generators $24,215; Canadian Westinghouse Company, engines $20,600, generators $5,690; Canadian Boving Company (1) engines, $14,500, generators $4,255, (2) engines $17,500, generators $4,255; Vandeleur & Nichols, (1) engines $14,500, generators $3,050, (2) engines $17,500, generators $3,200; Gorman, Clancy, Grindley, generator $5,675; Canada Foundry Company, engine and generators $21,050; Canadian Fairbanks Company, engine $13,922, generators $5,903; National Meter Company, engines $13,495, generators $6,500; Turner, Fricke, Pittsburg, engines $16,706.80, generators, $7,851; Chapman & Walker Company, engines $17,060, generators $5,630; Drummond, McCall & Company, engines $13,500. M. A. Maxwell, consulting engineer to Medicine Hat. Contract awarded to Chapman and Walker.

Montreal, Que.

Ald. L. A. Lapointe gave notice of a motion that in thirty days he would move the adoption of a by-law to borrow $5,000,000 for the construction and administration of a system of underground conduits, which was in accordance with the legislative powers obtained by the city.

An agreement has been reached on the long outstanding lighting question between Montreal city and the Montreal Light, Heat and Power Company, and the new contract price of $72.70 will be accepted by the company.

The Montreal Light, Heat & Power Company has entered an action claiming $7,000 from the town of Maisonneuve on a disputed lighting account.

New arc lamps are being installed in the town of Verdun, and it is claimed that the municipality is the best lighted place on Montreal Island.

The Board of Control, after various conferences with the management of the Street Railway Company, has arrived at an arrangement with the company for a new method of snow removal, which will be inaugurated this winter. The arrangement will not call upon the city to extend the company's contract. By the new understanding the company agrees to furnish freight cars for the carrying of snow to various dumps. In order to accomplish this the company will run short sidings in certain streets where freight cars can be stationed. Running near these sidings will be erected small platforms. Up the platforms double teams will draw sleighs loaded with snow. When at the top of the platforms the sleighs will be run on a level with the cars, and the snow will be dumped into the cars.

City Surveyor Barlow, at a recent meeting of the Board of Control, was given instructions to notify the Street Railway Company that it must haul no more freight in the streets. While there was no discussion about the matter it was understood the company was doing this work without a proper contract from the city.

It has been decided by the Board of Control that the huge electric signs which advertise so many tall buildings in Montreal must go, and a resolution has been passed instructing the Legislation Committee to draw up a by-law to that effect for presentation to the city council.

At last the street lighting problem has been settled by the award of a 10-year contract to the Montreal Light, Heat & Power Company, terminable by the city in five years if it so desires. The agreed prices are as follows: For 6.6 ampere lamps, $72.70; for 4 ampere lamps, $63.15; for 80 c.p. incandescent lights, $23, and for 40 c.p. incandescents, $16.

Three workmen of the Saraguay Electric & Water Company were arrested recently for cutting down trees. The company claimed that their charter gave them this right. Ald. Boyd, who is behind the prosecution, stated that it was simply a question of whether any charter could override the common law, which makes the cutting of trees a criminal offence.

Nanton, Alta.

On November 15th tenders will be received for $7,500 5 per cent. 20 year electric light and fire protection debentures. W. Robertson, secretary-treasurer.

New Westminster, B.C.

The construction of an electric interurban railway between New Westminster and Ladner, B.C., is reported to be under consideration by the Boards of Trade of this city and of Ladner.

Niagara Falls, Ont.

It is stated the Niagara, St. Catharines & Toronto Ry. Co. is planning an extension from Fonthill to Fernwick and the establishment of passenger service to the last-named point. Definite announcement of plans has not yet been made by the company.

The property owners on McRae street are erecting on this street and presenting to the town one-half dozen concrete electric lamp pillars. The pillars are twelve feet high.

Mr. F. J. Roberts, superintendent of the Symmes Construction Company, this city, will shortly undertake the building of a power plant in the Porcupine district. Mr. Roberts states the plant will generate from 6,000 to 8,000 horse power, and will be at Sandy Falls, on the Migozoni river.

North Toronto, Ont.

The tender for the lighting of North Toronto by the Interurban Electric Company was not accepted by the Water, Fire and Light Committee, because it was stipulated in the tender that the company be granted a ten years' license, which the town was not willing to do.

North Bay, Ont.

The Cobalt Hydraulic Power Company have been granted permission by the Crown Lands Department to place dams at each outlet or the Temagami lake to raise the water for storage purposes to a height of 18 inches aoove low water mark, for the purpose of ensuring a permanent flow of water for the power plant supplying Cobalt. Hon. Frank Cochrane has informed the objectors to the proposition that the dams will not interfere with the interests at Sturgeon Falls.

Ottawa, Ont.

The Quebec Railway, Light, Heat & Power Company seeks an extension of its powers and in the Canada Gazette gives notice of application for legislation at the next session for powers "to operate railways throughout Canada."

The Minister of Railways has approved the application of the Toronto & Eastern Railway Company for approval of its route map from Oshawa to Cobourg and also to Lindsay and Port Perry.

Mayor Hopewell has written the various companies having wires in the main thoroughfares of the city, asking them, in the event of it being decided that the wires will be put in conduits, just what kind of conduits would be suitable for their purpose. The mayor has also asked them to send representatives to a conference with the city in this connection.

Controller Hastey has submitted a plan for the proposed illuminated sign to be erected some prominent place so as to flash a welcome to visitors to the city. The design proposed is a large maple leaf with the words, "Welcome to Ottawa," in letters from four to eight feet high. The entire sign would be 44 feet high and 52 feet long and would cost $850, with flashes. The cost of operating it would be about $25 a week.

In regard to the lighting of Sparks street, it is proposed to erect 44 standards each supporting five tungsten lamps of 50 candle power, which would be placed between Sappers bridge and Bank street. The lamps would be located at the edge of the sidewalk 100 feet apart, but as they would alternate from one side to the other the distance between each light would be but 50 feet. The Ottawa Electric Light Company would furnish the lamps, standards, equipment and current, and the work can be done in a month. The residents are being canvassed as to their feeling on the matter.

The Supreme Court of United States has been asked to decide whether it is unlawful for one wireless company to prevent the transmission of messages by an opposition firm. The steamer Western States had an accident off Long Point on Sept. 21 and tried to get in communication with the stations at Buffalo and at Dunkirk. Every effort was frustrated, it is alleged, by operators for a rival wireless company, Ernest C. E. Goodwin and Nelson Holt, the operators alleged to be directly responsible for the interference, were arrested on a charge of violating the penal law. Goodwin was committed to jail but was released later on a writ of habeas corpus. After hearing the evidence Justice Hooker, in special term, reserved decision.

Mr. Andrew Haydon has been elected president of the electric road to be built from Ottawa to Brockville. Mr. D. H. McLean is vice-president and Mr. H. C. Woods of Montreal is secretary. The other directors are: Messrs. G. Kidd, K.C., W. Greig, H. C. Cooper, Montreal, and ex-Ald. S. Rosenthal. Mr. Fred A. Heney, reeve of Nepean, Mr. MacDiarmid, Monteral, J. H. Gilbour and W. C. MacLaren were among the shareholders present. It is understood that the work on the road will be commenced immediately after the plans and surveys are completed. The road will be started from both ends of the line.

Phoenix, B.C.

The electrical transformer station of the Granby Consolidated Mining, Smelting & Power Company, which supplies power for the company's many miles of tram system, and which was recently destroyed by fire, is being rebuilt of brick and concrete with metallic covering, and will be completed in a few days.

The production of the British Columbia Copper Company during the first seven months of the year was as follows: January, 656,473 pounds; February, 683,234 pounds; March, 891,419 pounds; April, 340,061 pounds; May, none; June, 417,040 pounds; July, 574,172 pounds. The company's furnaces have been enlarged and the smelting capacity is about 2,000 tons of ore per day.

Peterborough, Ont.

Mr. Monds, of the firm of Clarke & Monds, Limited, Toronto, contractors, has arrived in the city to take charge of the general construction work of the new power development house near Auburn. The work consists of a new canal on the west bank of the river, and a new power house just above the railroad bridge on the Lakefield branch.

Port Credit, Ont.

The Hydro-Electric Commission have awarded the contracts for the sub-station here to supply Brampton, Milton and other municipalities which have applied for power. The building will be erected by Stewart Bros., of Port Credit; the Allis-Chalmers-Bullock Company, of Montreal, will supply the transformers, and the switching equipment will be installed by the Canadian Westinghouse Company, of Hamilton.

Prince Albert, Sask.

The by-law to build additional boilers for power house at cost of $7,000 was carried.

The council have authorized C. H. Mitchell, of Toronto, to prepare plans, etc., for city power development at LaColle Falls. It is planned to develop 10,000 h.p. and to have everything ready to let contracts by May 1st, 1911. Expenditure, about $1,000,000.

Prince Rupert, B.C.

The Tsimpsean Power Company's water rights on Khtada river are estimated as sufficient to give the company something like a 40,000 h.p.

Quesnel, B.C.

A proposition is on foot to provide for a light and power plant to serve local needs. Leading business men promise support.

Quebec, Que.

The Sillery extension of the Quebec Railway, Light, Heat & Power Company was opened during the month. A half-hour service will be given on the line regularly.

The pay-as-you-enter cars which were secured by the company some time ago, were taken out for the first time during the month, and are very popular with all the citizens. They appreciate the cross seats, and the convenience of the signal bells. The entire system is in splendid running order, and Quebec Street is proving a decided success, both as a financial and commercial undertaking.

Regina, Sask.

Mr. Thornton, who built the Edmonton Street Railway, has been retained by Regina to lay out the route of their car lines.

Renfrew, Ont.

Dr. McCormack presented a report from the waterworks committee recommending that a revetment wall at the Renfrew Electric Company's intake pipe be built this fall in order to protect the company's property and enable the council to proceed with the building of the new power house intake at the earliest possible moment next spring. The report was adopted.

Saskatoon, Sask.

A franchise for the construction of a street railway is being sought by the same interests as are constructing Moose Jaw's system, and the electors will probably decide, at the regular municipal elections, between this and a municipally operated road.

Stratford, Ont.

The railway agreement has been signed between the Stratford Railway Company and this city by which the road is to be completed by Feb. 15, 1912 and a connection made with some point on Lake Huron by April 15th, 1912. It is said the storage battery system as used in New York will be investigated and may be installed.

Scotstown, Que.

The new Lingwick branch of the Canadian Telephone Company is completed and is now in operation. This new branch connects Guld, Red Mountain and Galson with Scotstown.

St. Boniface, Man.

On October 7th a meeting was held of representatives from the various cities, towns, villages and other places outside Winnipeg to consider the advisability of making an effort to secure cheap power.

St. John, N.B.

A public investigation into the alleged excessive rates charged by the New Brunswick Telephone Company in the city of St. John seems assured. H. A. Powell, K. C., representing the Board of Trade, is making the charge. The investigation will be before the Public Utilities Commission, composed of Col. D. McLeod Vince, Woodstock, chairman; F. P. Robinson, Fredericton; O. M. Melanson, Shediac, and G. Dickson Otty, of this city.

St. Vital, Man.

The Rural Railway Company (Jos. Bernier, Secretary, Manitoba), is stated to have applied to the municipal council for a franchise to build a five mile electric railway from either Winnipeg or St. Boniface to St. Vital. Chas. E. Lewis, Minneapolis, Minn., president.

Tillsonburg, Ont.

Tenders for erection of hydro-electric power house were received from Tillson Company, for $1,200 (accepted); W. Ferguson and Thos. Fern, $1,325.

Toronto, Ont.

The suggestion is now made that as the Street Railway Company is building about 25 miles of extensions at the order of the Railway Board and not of their own free will the yearly mileage payment of $800 will not be collectable.

The Legal Department has been instructed by the Board of Control to prefer a criminal indictment against the Toronto & York Radial Railway Company because of its failure to keep that part of Yonge street over which it runs cars in a proper state of repair.

The following tenders have been awarded in connection with the Civic Electrical Department: Storage batteries, Chapman & Walker Company, Limited, at $2,870; transformers, Canadian General Electric Company, at $15,800; motor generator sets, Lancashire Dynamo & Motor Company, at $2,262.

The construction of some ten miles of single track to serve the newly annexed northern districts east and west of Yonge street is being discussed by the council. The total cost is placed at $750,000. A vote may be taken on January 1st.

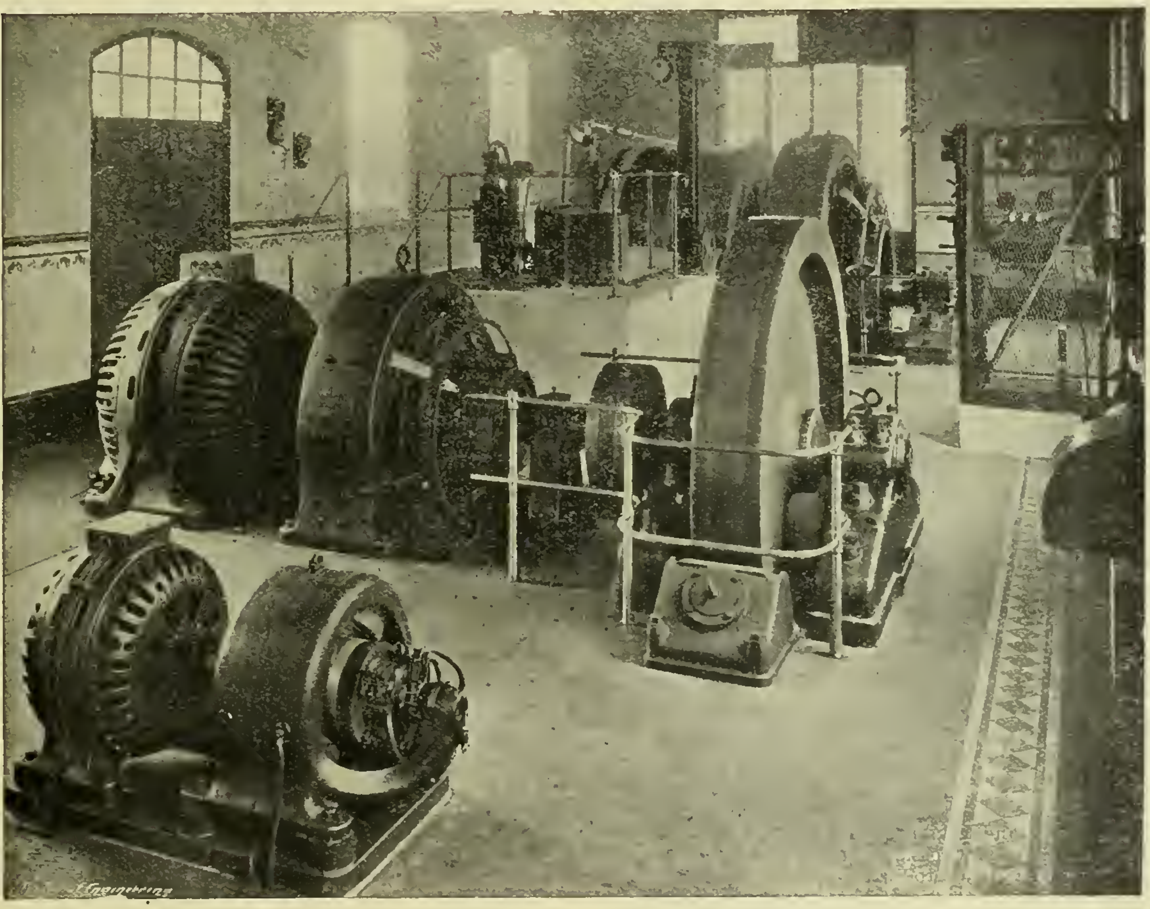
The Ontario Hydro-Electric Commission is making application to the Electric Power Company, Limited, the interests which control the power production in the Trent Valley, for power to be served to Coburg, Whitby and other towns in the Midland district.

The contract with the Bell Telephone Company expires April 21st, 1911. The city hall service is said to be inadequate and the company has submitted a proposition to install an additional switchboard and operator. If given a ten-year lease the company offers the following yearly rates: 27 wall sets at $20 per year each, $540; 44 desk sets at $22, $968; 10 keys at $2, $20; 1 extension bell at $2, $2; 20 trunk lines at $30, $600; generator power, $30; rental of board, $800; total, $2,760.

The Toronto Electric Light Company has again offered to sell out its plant to the city and negotiations have been in progress without, however, any apparent progress being made.

A settlement has been reached between the Toronto Electric Light Company and the city. By this agreement the company is to hold over its application for an injunction to restrain the city from proceeding with the installation of its electric distribution system subject to the terms of the agreement. These terms are that all matters relating to the public safety in connection with the installation and operation of the two systems are to be referred to the engineers of both parties. Should the engineers fail to agree either party may resume the action upon giving seven days' notice to the other party. Either party may change its pleadings at any time before January next. The agree-

SIEMENS



Siemens Ilgner Winding Plant, Cynon Colliery, South Wales.

Siemens Bros. Dynamo Works
Limited
London, England
Head Office for Canada:
Canadian Birkbeck Building, TORONTO

ment further provides that no old rights are to be affected nor any new rights created by the agreement.

The city will give a necessary one year's notice of its intention to purchase that part of the Toronto & Mimico Radial Railway, something over one mile, and will apply to Parliament for power to take over the entire road from Sunnyside to Port Credit.

The city's electrical department has outlined a plan for a telephone service connecting its various offices and the substations of the municipal hydro-electric system. The heart of the system is to be at the terminal station on Stratchan avenue. This will be connected by ten trunk lines with the City Hall. The general offices will be located in the City Hall during the daytime, but at night they will be switched over to the Strachan avenue station, the general operator being at the latter place.

Verdun, Que.

Seventy-five arc lamps ordered by the town council for the lighting of the streets are now being installed.

Vancouver, B.C.

Plans were approved by the board of works for the B. C. Telephone Company's extension of its system in Kitsilano. The trunk lines will be placed in the lanes between Third and Fourth avenues and extend as far west as Bayswater street.

The new agreement has been arranged between the city and the B.C.E.R. Company with regard to the lighting or ornamental street standards now being installed. The company agrees to supply the necessary energy at 2 cents per kilowatt hour according to the registering of the company's meters. All standards will be installed and maintained by the city.

About 725 men are employed by the Vancouver Island Power Company in their work at Jordan river, where a large hydro-electric power plant is being installed and the monthly pay roll averages $70,000.

The B. C. Electric Railway extension from New Westminster to Chilliwack, was opened on Monday, 3rd inst.

Mr. E. J. MacGougan, a well known Spokane telephone expert, is coming to Vancouver to assume the position of commercial superintendent of all lines of the British Columbia Telephone Company.

Aldermen Whiteside and Hepburn, along with City Electrician McCrossan, have been appointed a committee to take up with the B. C. E. R. & B. C. Telephone Company the adoption of a better arrangement with regard to the carrying of high voltage wires in alleys, especially where they come in close proximity with buildings. This was brought about by the dangerous condition of B. C. E. R. high potential wires in the lane west of Granville street, which are considered to be altogether too close to the line of the buildings, and in some instances touch the ironwork of fire escapes. A motion was passed by the Fire and Police Committee prohibiting the erection of fire escapes in this district until the wires have been either removed or in some manner protected.

Victoria, B.C.

Professor Adam Shortt, of Ottawa, who is here, says there is no reason why wireless should not be used extensively for locating ore bodies. The trials already carried out have shown that communication between two mine galleries has been lost when a seam or coal or other ore has been reached.

The Dominion station at Triangle spoke to Honolulu recently, establishing a new record for wireless telegraphy on this coast. The distance is 2,500 miles. Triangle is a small island on the northern end of Vancouver Island. Its location was shown in the August issue of the "Electrical News."

Additional street lights as recommended by the electric light commissioners have been approved by the city council.

A. T. Goward, local manager of the B. C. Electric Railway Company, announces that a location line of the proposed Saanich extension will be run at once.

Negotiations between the city and the B.C. Electric Company to ascertain what it is now costing the city to produce its power for street lighting purposes are under way. Under the agreement entered into by the city and the company relative to the development of the Jordan river power proposition, the company undertook to supply power to the city at one-half of what it is now costing the city to produce power. The city has submitted figures to the company showing approximately what this present cost is and the company is now examining some of the city's accounts in an effort to verify this figure. It is expected that a joint meeting of the special committee appointed by the city and company officials to discuss the matter will be held. It is understood that the company contends that certain administration charges should be included in the city's figures and considerable discussion will doubtless ensue before a final figure of cost is arrived at.

Watrous, Sask.

The clerk was instructed by council to wire National Securities Company to frame an agreement for approval for the installation of an electric lighting system and for the proposed car line.

Wynyard, Sask.

The town council has decided to instal street lighting, and experiments will begin immediately as to the most suitable light until power for electric lighting is available from the C.P.R. roundhouse.

Windsor, Ont.

The General Electric Company and other companies in the Water Power Trust are opposing the importation of Niagara Power into Detroit. They will contend that the existing legislation applies only to the admission of power in the immediate vicinity of Niagara Falls. Failing to establish this, new legislation will probably be introduced imposing a prohibitive duty on electric power.

Welland, Ont.

At a special meeting of Welland town council, the time when Welland street railway has to be commenced, or the local franchise lapse, was extended until May 15, 1911. The reason given was the late opening of Parliament, which delayed the securing of a charter.

Winnipeg, Man.

The tenders for excavations for the power substation on King street have been let to George W. Vincent at $1,584, work to be commenced at once.

The first consignment of machinery for the municipal power plant at Point Du Bois arrived during the last week in September. It consisted of one large generator turbine and two small exciter turbines all manufactured by the Jens Orten-Boving Company in Sweden. Four more turbines are on order.

Representatives of a dozen cities, towns and municipalities of this province recently waited on Premier Roblin and other members of the Government urging that steps be taken for supplying electrical power to all municipalities of Manitoba outside of Winnipeg. Premier Roblin promised his earnest consideration of the whole question, but thought it unwise to make any move until the power plant of the city of Winnipeg was in operation and it had been ascertained what power the city might have to offer for sale to outside municipalities.

A lawsuit of quite unusual interest is in progress here before Mr. Justice Robson, in the case of Allis-Chalmers-Bullock Company vs. Walker. It arises out of certain machinery installed in the Winnipeg theatre in July, 1906, by the Allis-Chalmers-Bullock Company, including a generator, switchboard and other machinery which supplied the lighting power, ventilating apparatus, etc., in the theatre. The suit is brought by the company to recover $1,565 alleged to be the balance due on the contract. The whole trouble arose over the fact that the engine created so much noise and vibration as to disturb and annoy the patrons and employees of the theatre. The defendant counterclaims for $2,500, the cost of a new engine, and $10,000 for loss sustained in his business by reason of the annoyance and disturbance of his employees and patrons.

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11

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Generation, Transmission and Application of Electricity

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The "Electrical News" will be mailed to subscribers in Canada and Great Britain, post free, for $1.00 per annum. United States and foreign, $2.00. Remit by currency, registered letter, or postal order payable to Hugh C. MacLean, Limited.

Subscribers are requested to promptly notify the publishers of failure or delay in delivery of paper.

EDITOR'S ANNOUNCEMENT.

Correspondence is invited upon all topics coming legitimately within the scope of this journal. Subscribers can materially assist by sending in news items and information regarding electrical development in all parts of Canada.

Vol. 19 Toronto, December, 1910 No. 12

Corporation Treatment of Private Interests

If the attitude of The Calgary Herald can be taken as typical of Western ideas there is much to be said in favor of the movement of our Eastern youth westward. We have repeatedly pointed out the apparent lack of sportsmanlike treatment accorded many privately operated enterprises in Ontario and have endeavored on more than one occasion to call the attention of municipalities, and governments, to the fact that might is not necessarily right, and that common justice demands that fair consideration be given to those who have given of their best in capital and energy to facilitate the progress and development of Canadian industries. Some one on the Calgary Council is, for the moment, evidently intoxicated with the thought that the end justifies the means and the Herald's outspoken article is timely and forceful. The article says in part:

"The Herald believes that the city should secure a good power site and hold it with as little development as possible for the present, but with a view to future contingencies. It does not believe, however, that the city should secure a power site by stealing it from anyone else, and in this case there seems to be some indications that the city's attitude is unfair to private individuals.

"If, as it stated, it is true that the Western Canada Power Company applied for a site, and that thirty days afterwards the city applied for another site farther down the river; and if, as is also stated, the city now proposes to take the water for its site out of the river at a point above the power company's site and flume it to the civic site, thus destroying the value of the power company's site for which it applied in good faith, then The Herald does not believe such an action would be square. An incorporation should be a model to individuals in its business conduct, and without expressing any opinion on the power company's proposition, The Herald does not believe that the city should seek any undue advantage over it."

We are heartily in accord with the sentiment "that a municipality should be a model to an individual in its business conduct." Further, if municipal operations cannot be successfully conducted on a business basis without resort to unfair protection or discrimination their ultimate chances of success would appear to be far from assured.

Good Cause for Dismissal

Patrons of street car systems can be depended on, to the last unit, to voice their approval of the recent prompt action of the manager of the Winnipeg Street Railway in dismissing four of their conductors for frequenting a saloon while in uniform, that is, while on duty.

The men made some kind of defence, they were drinking non-alcoholic beverages, etc. In the mind of the travelling public, however, it is enough that these men were in a bar-room—for two reasons it is enough—first, a well known and definite rule of the company by whom they were employed was being deliberately broken; second, the motorman who steps from the bar-room to his controller inspires anything but confidence in the patrons whose lives he holds in his keeping for the time being.

The men were ill-advised enough to threaten a strike if the drinking members of their union were not reinstated. This, too, in direct defiance of the Dominion Act which forbids such action. The matter, however, has been submitted to the Government, who are appointing a Board of Conciliation.

And not only will the public applaud this prompt action on the part of the company but they would settle down in their seats with a still greater feeling of security if they knew that every motorman and conductor on the system had to be an absolute, total abstainer off duty as well as on. Such requirements are not as rare as they once were and the day is fast coming when nothing less will be demanded by their patrons from every public service corporation.

Montreal Street Railway Fifty Years Old

Montreal Street Railway's annual statement contains, in addition to a successful financial showing, a retrospective history of the progress of the company since its organization fifty years ago.

The first car line in Montreal was opened in 1861, with six miles of single track and eight passenger coaches. The company at that time was capitalized at $125,000, and the population of Montreal was about 100,000. Progress was slow until 1892 when the mileage had increased to twelve miles and the population to something over 200,000. In 1892, despite most vigorous opposition, resulting in the resignation of many of the directors, it was decided to electrify the road, and the figures just submitted in the annual report bear evidence of phenomenal growth since that date. The present capital is $10,000,000, together with a bond issue of $4,420,000. Last year's gross earnings were $4,352,551, and net $1,897,250. Of this amount the city receives $278,084, more than twice the original capital of the company. There are now 280 miles of track and the city's population is calculated in the neighborhood of 600,000.

The original directors of the company were Messrs. William Molson, John Ostell, William Dow, Johnstone Thompson and William Macdonald. The directors for the year just ended included Hon. L. J. Forget, president; K. W. Blackwell, vice-president; W. G. Ross, managing director; Sir H. Montagu Allan and Messrs. George Caverhill, Paul Galibert and Robert Meighen.

During the past few months, however, the control of the street railway stock has been secured by another group of financiers, chief of which is J. W. McConnell, of the Canadian Power Company, with the result that at the annual meeting held in Montreal on November 2nd, an entirely new board was elected, the personnel of which is as follows: E. A. Robert, president; J. W. McConnell, vice-president; D. McGibbon, F. H. Wilson, Geo. G. Foster, K.C., W. C. Finley and J. M. Wilson. Mr. Duncan Macdonald is retained as general manager, as are also all the other executive officers in their various capacities.

The composition of this board indicates the close relations which now exist between the Street Railway Company and the Canadian Power Company, the latter a generating company which is constructing a 12,000 horsepower plant at St. Timothy, for the board of the Canadian Power Company includes F. H. Wilson, president: E. A. Robert, vice-president; George G. Foster, K.C., W. C. Finley, J. W. McConnell and J. M. Wilson.

The new president of the Montreal Street Railway, Mr. E. A. Robert, was born in Beauharnois, Que., and is 46 years old. He was educated in the Montreal High School and Montreal Business College. In 1881 he entered the dry goods firm of Greenshields, Limited, where he remained nine years, leaving there to take over his father's woolen milling business at Beauharnois. This business later developed into the Dominion Woolen Manufacturing Company, with Mr. Robert as managing director.

Mr. E. A. Robert.

Mr. Robert's first water power venture was in connection with a St. Lawrence water fall known as the Bisson Point power, which later became absorbed by the Montreal Power interests. In 1901 and following years up to 1907, Mr. Robert was continually negotiating with the Dominion Government for a lease of the Beauharnois Canal power. The present Canadian Light & Power Company, organized chiefly by Mr. Robert, and of which he is vice-president and managing director, is the aftermath of the successful negotiations. In Mr. Robert's latest move, the formation of a syndicate strong enough to wrest the control of the Montreal Street Railway from the hold of the wealthy group of men who controlled it, the most noticeable feature seems to be the unobtrusiveness of the victory an apparent characteristic of the man who engineered it.

Alberta Wants Hydro-Electric Commission Too

Following Ontario's lead, a number of Manitoba municipalities in the Winnipeg district recently approached their Government with a request for the formation of a Hydro-Electric Commission similar to the Ontario Commission to exploit the water powers in that section. The Government, while not enthusiastically in favor of the project, did not refuse the request but counselled delay pending the completion of the Winnipeg municipal plant at Point du Bois, which may be found equal to the needs in the immediate neighborhood at least.

Now the Government of Alberta is daily expecting a similar request. At Red Deer within the last few days a resolution asking the Government for the establishment of a commission was passed by the council, and the city of Calgary will probably pass a similar resolution. The Red Deer petition reads as follows:

"The council petitions the Province of Alberta to appoint a commission to investigate the water power resources of Alberta with the view to the establishment of a hydro-electric system by the province and urges the executive council of the Union of Alberta Municipalities to urge the matter upon the Government in the interest of the municipalities.

In all probability a number of municipalities will get together and form a "power union" after which a general petition will be formulated for presentation.

Placing of Electric Meters in Private Houses

Mr. H. Webster, central station manager, Norwich, Ont., sends us the following original letter with reference to the proper placing of electric meters:

"A great deal of attention has been given to interior wiring, street wiring, etc., but not even a thought to the placing of the electric meters, which means considerable in the economical running of an electric plant.

"Meters are sometimes placed in a cellar where it may be damp, where dishonest customers have every chance to bridge or tamper and where light is usually bad; or in a dingy attic, making it necessary for the meter reader to climb several flights of stairs, while he receives savage looks from the housekeeper for dirtying and wearing out the carpet; or, perhaps, in the bathroom, where some one may be taking a bath when the meter reader arrives, making it necessary for him either to wait ten or fifteen minutes to get access or call again.

"The writer finds the proper way to install a meter in a residence is under the verandah roof, in the porch, or under the roof of the back stoop, fastened to the wall about seven to nine feet above the floor. The main switch and cut-out can as a rule be conveniently installed along with the meter and placed in such a position that they do not show from the street.

"The advantages of installing meters in such places outside the house are not inconsiderable. Among the evident ones might be mentioned.

"A meter reader will read three times as many meters in a day; he never has to make the second call, never disturbs the inmates of the house or wastes five or ten minutes listening to the latest news, and has always good light to read by; a current thief will never attempt to tamper with or bridge a meter when he knows an inspector or meter reader may be around at any moment; in addition to the above the meter is dry, clean and safe.

"This is not simply a theory, as the writer has carried out this practice of placing meters for service in porches and verandahs for the last four or five years with perfect satisfaction, never having the slightest thing go wrong, and now the customers insist on having their meters outside."

Public Utilities Commission at Montreal

The Quebec Public Utilities Commission, composed of Lt.-Col. Hibbert, chairman, Sir George Garneau and Mr. Laberge, recently devoted considerable time in Montreal to the taking of evidence on street railway conditions, chiefly with a view to evolving some system by which the number of accidents on the Montreal Street Railway System may be lessened. In this investigation the commission availed themselves of the expert assistance of Mr. P. W. St. George and Mr. Duncan Macdonald, general manager of the street railway, also gave valuable evidence.

The evidence in general showed that the employees were well trained and cautious. The fenders came in for much criticism with the almost unanimous opinion that they tend to increase rather than diminish accidents, as, by projecting some four of five feet in front of a car, they often catch a pedestrian who, with another five feet of space, would get clear of the car. Wheel guards were considered preferable, especially for slow moving cars up to eight or ten miles an hour. A New York report, brought in as evidence, stated that fenders are an actual source of danger even with speeds as high as fifteen miles an hour.

The advisability of changing the present custom of stopping on the first side of streets was defended by Alderman Brodeur. A by-law has actually been passed by the city council requiring the Street Railway Company to stop at the far corners, but has not yet been enforced. The matter was left in abeyance pending further evidence.

Electrolysis in Illinois Traction

A decision of considerable importance has recently been handed down by Judge Sanborn, of the United States Circuit Court, for the Northern District of Illinois in the matter of the long-outstanding dispute between the Illinois Traction Company and the Peoria Water Works Company, as to the extent of the railway company's liabilities for damage by electrolysis to the pipes of the waterworks company. Evidence was sought with a view to determining (1) the exact conditions under which damage is caused by electric currents, and (2) whether the railway company was taking all reasonable precautions to prevent leakage of their currents to the water pipes. The evidence as to the cause was, on the whole, unsatisfactory and contradictory, inasmuch as it was evidently the opinion that theory and practice in electrolysis did not entirely agree or, at least, that too much depended on the surrounding conditions to justify an opinion as to what might happen in any individual case.

The system of current return used in Peoria is by the rails, which are connected by brazed bonds, welded joints, etc., with cross wires between rails and assisting the return by feed wires from rail to negative side of dynamo at regular distances from the power house.

An alternative plan suggested, called the quadrilateral or constant potential system, is a modification of the present system with additional bonding at crossings and switches. The purpose to is to reduce to a constant potential all the negative feeder points and by spreading the feeders in the shape of a fan, to equalize the pressure all over the rail system. Another plan, called the drainage system, consists in cross connecting with copper wires the return rails and the water pipes.

The evidence did not show that any system of bonding is entirely satisfactory, but in view of the fact that the trouble seemed to be diminishing in recent years the judgment orders that "the company shall be given a reasonable time to take such measures or make such improvements to its negative return as shall substantially prevent injury." The condition is also attached that the water works company shall co-operate in making such improvements or changes as may be necessary in this work.

Sherbrooke Railway and Power

This power plant is nearing completion. There only remains a small section of the large concrete dam to be completed, and the steel penstock is all connected up except for a small portion, which will be put in place as soon as the last part of the dam is filled in. At the power house the 16-foot diameter steel stand pipe, which is 56 feet in height, has been completed for some time, and the turbines are ready for installation and will be put in place on the arrival of the generators, which have been somewhat delayed, but which are expected to arrive in time to permit of the plant being in operation by the end of the year. Contracts have already been signed up for a portion of the power to be developed, and there are several prospective contracts which will use up the majority of the available power. The transmission line to Capleton has been commenced and should be finished in about two weeks. A step which should prove of benefit to the Power Company is the recent formation of the Sherbrooke Board of Trade, through which endeavors will be made to induce new industries to establish themselves in Sherbrooke.

The new general manager of the Sherbrooke Railway & Power Company, Mr. Norman C. Pilcher, brings to his work a wide and successful experience in electrical engineering and management. His practical education began with six years training, 1894-1900, in the shops of the Montreal Street Railway, which he left in the latter year to accompany the Canadian troops to South Africa. On his return he was appointed assistant engineer to the Birkenhead Street Railway in England, where he served for a year before returning to Canada to enter the Engineering Department of the Canadian General Electric Company, Toronto. His next move was to Port Arthur to accept the position of general manager of the Port Arthur & Fort William Street Railway, which position he retained until his recent move to Sherbrooke.

Mr. N. C. Pilcher.

No higher tribute to the success of Mr. Pilcher's work is necessary than the record growth of the twin city railway system under his management. During that time the gross earnings have practically doubled, the mileage has increased from 14 miles to 18¼, with further extensions contemplated, and the operating cost per car mile was reduced from 22.186 cents to 14.82 cents.

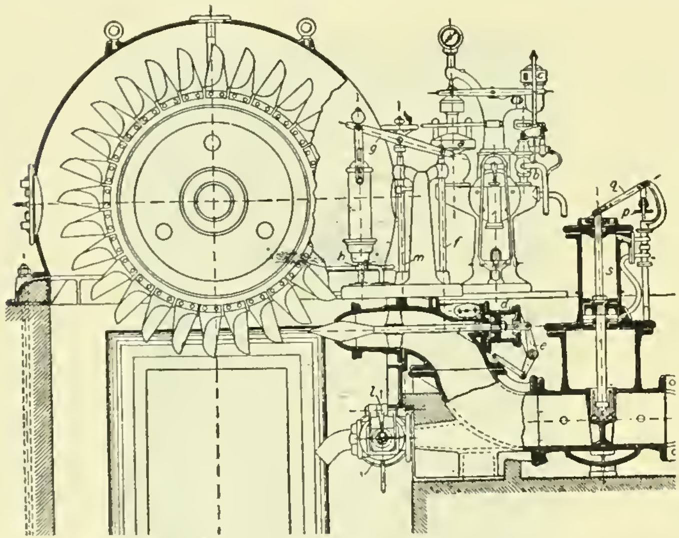
The new manager will evidently feel much at home in the busy Sherbrooke atmosphere, where extensions and improvements are being rapidly pushed forward.

Water Powers in Alberta

Along the Athabaska river descending from Athabaska Landing to McMurray there are numerous falls. Mr. William Ogilvie, D.L.S., speaking of the Athabaska river, says: "The current averages well over four miles an hour, but the rate varies much with the height of water. Grand Rapids fall about 60 feet in ¼ mile. They are a fine sight and will, when required, develop a lot of power. I would say in the average season fully as much as the Chaudiere Falls at Ottawa'' (say 80,000 h.p.). From these rapids down to McMurray, a little over 80 miles, there are many rapids, but none of them appear to warrant the assurance of much power from them, although one or two might furnish a head of 6 or 8 feet.

The Water Powers of Switzerland

The last decade's progress in hydro-electric generation has been nowhere more marked than in Switzerland, for, although this country can boast no exceeding large water powers, they can probably lay just claim to the greatest number of high-head developments. Probably the highest head developed in the world is at Vouvry, near Lake Geneva, where a plant has been constructed for a maximum capacity of 20,000 h.p. under a 3,116-foot head. A 26,000 h.p. plant on the Poglia operates under a 2,800-foot head, and there are a number of other plants of 1,000 feet or over. For such high heads the impulse high pressure type turbine is used, as exemplified in the cross-sectional drawing reproduced herewith. The turbine is a very simple machine consisting only of a number of buckets circumferentially mounted. Water is supplied to each wheel through a needle-shaped nozzle. The European impulse wheel is frequently supplied with nozzles of square or rectangular openings.



Escher-Wyss High Pressure Impulse Type Turbine.

A complete description of a recently completed 45,000 h.p. plant at Brusio, operating under a 1,300-foot head, is just to hand. A tunnel, three miles long, through the mountains, forming the head race, leads the water to a forebay. This forebay is cut out of the solid rock 30 feet deep and 225 square yards in area. Water enters the pipe lines here through taper pieces, the entrance to which can be closed instantaneously in case of emergency, by means of flap-valves electrically operated from the power house. There are six main steel pipe lines, 3 feet in diameter, and about 4,000 feet in length; these were manufactured and installed by the Escher Wyss Company, of Zurich. The wall thickness of the pipe lines increases, with depth, from 1-5 to 4-5 inches. For about one-third of the descent the pipes are riveted; the remaining two-thirds are lap-welded by the water-gas process. The pipe lines are securely anchored to massive concrete pillars at ten different angle points between the forebay and the power house.

The turbines, twelve in number, two being supplied from each pipe, are Escher Wyss high pressure impulse type, guaranteed 3,500 h.p. capacity, but actually under test developing 4,200 h.p. The figure represents, in diagram, a cross-sectional view of these turbines. The quantity of water delivered to each turbine is regulated by means of a needle nozzle automatically operated by a pressure governor. The nozzle diminishes or increases the diameter of the water jet, producing a solid jet of water free from air and bubbles.

The generators are 3-phase, a.c., 50-cycle, 7,000-volt type, manufactured by the Alioth Electrical Company, of Münchenstein. The current is led at this pressure through a tunnel some 600 yards in length over the Swiss-Italian frontier to Piattamala, where the step-up transforming station raises the voltage to 50,000. The high tension transmission system, leading out from this point, consists of twelve insulated copper cables.

Brandon Steam Heating Plant a Success

The distribution of steam through underground mains for supplying heat to the business section of Brandon is being successfully performed by the Brandon Electric Light Company. The mains already installed cover the principal business district and the success attending the present installation will probably induce the company to extend the system rapidly into the residential area.

Although not a new idea, the distribution of steam over large areas has not in the past been a great success, owing to the difficulty of overcoming the heat loss in transmission, and it is only by exercising the greatest care in the installation of its pipes and by using the most modern methods of preventing heat conduction that the Brandon Electric Company has been able to insure success to their new venture.

The mains are of wrought iron and are first carefully wrapped in asbestos paper held in place by spirally wound copper wire. This pipe is enclosed in a wooden cylindrical casing, the pipe being centred and supported by roller and ball bearing guides which allow free expansion and contraction with change in temperature. The wooden casing is four inches thick and constructed of kiln-dried, tongued and grooved white pine. The inside of the casing is lined with bright tin and the outside tightly wound with heavy galvanized wire. The whole log is finally covered with a heavy coating of asphaltum. Expansion devices are enclosed in brick boxes every fifty feet and manholes give access to the valves at the street intersections.

It is believed that under this system of precautions condensation will not amount to more than 5 per cent. of the company's steam output. The principal on which payment is made depends on the quantity of condensed water which collects in the customer's building.

Electrical Convention in Winnipeg

The 1911 convention of the Canadian Electrical Association will be held in the city of Winnipeg. This was the unanimous decision arrived at by the Managing Committee at a meeting held in Toronto on November 23rd.

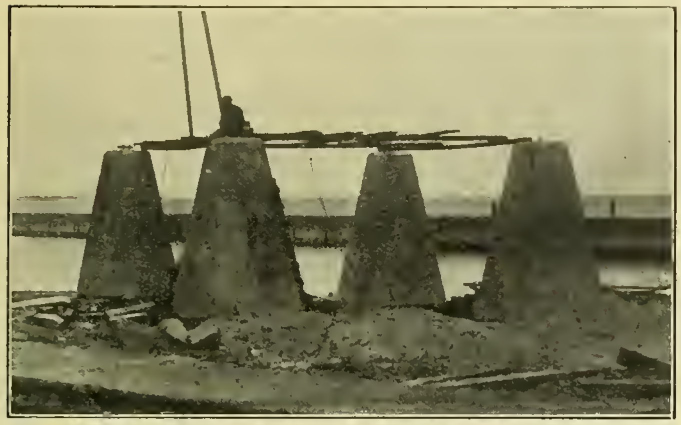
The Chateau Laurier, Ottawa, will not be completed in time for the convention, and it was thought advisable to postpone the visit to that city until 1912.

Start now to ''boost'' for the Winnipeg convention. It can and will be made a big success.

The passenger transportation system within the limits of New York City comprises nearly 2,000 miles of track over which 12,000 passenger cars are operated carrying about 1,500,000,000 passengers per year. The average annual increase for the last ten years has been about 68,000,000 passengers.

The employees of the Toronto Electric Light Company section of the National Electric Light Association are publishing a bulletin monthly, the first issue appearing in October. The editor is Mr. S. G. Redway, assisted by a committee composed of Messrs. E. Creed, R. F. Pack and L. V. Webber.

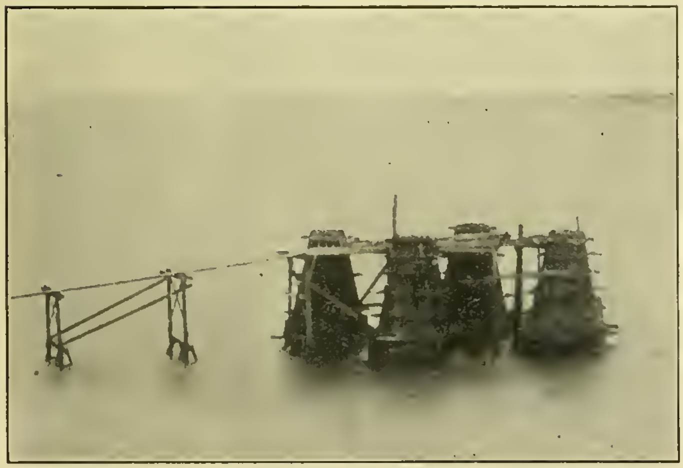
Hydro-Electric Progress at Sunnyside



Near View of Completed Tower Footing at Sunnyside where Line Enters Lake.

Very rapid progress is being made on the installation of the transmission towers along the water front from Sunnyside to the Toronto Exhibition grounds. Most of the footings are already in place, a number of the towers have been erected, and it is expected that everything will be in readiness for delivery of power at the Strachan avenue terminal station about the beginning of December.

The accompanying cuts illustrate different phases of the concrete work in connection with the placing of the tower footings. It will be remembered that the unusual difficulties standing in the way of a properly guarded right-of-way by land, decided the Commission to adopt the water route. The depth of water where the tower footings are placed is anywhere from 4 to 7 feet. The methods of anchoring these footings vary considerably, depending on the conditions of the sub-soil; in some cases the earth is excavated to a depth of 8 or 10 feet, where the foundation is begun; in other cases piles are also driven deeply into the ground and the concrete built around them. Where rock was encountered holes were driven down about 3 feet and heavy anchor bolts inserted.



Near View Tower Footing, Casing not yet Removed.

The tower footings, as shown in the accompanying sketches, are of cement, 10 feet square at the base. This full 10-foot size of the footing is maintained right up to the water surface where it begins to taper. The exposed part of the footing is fifteen feet high and three feet square at the top.

Hydro Electric Tower Footings set in Lake

The Strachan avenue Terminal Station, where the 110,000-volt current is stepped down to 13,200 volts for Toronto distribution, has just been subjected to a 240,000-volt test by the Hydro-Electric engineers. The test lasted for a full minute without any sign of trouble. The test was made with the portable testing set which has been used throughout by the Commission and which has a capacity of about 300 h.p.

Recent Advances in Electric Furnaces

The Department of Mines, Eugene Haanel, Ph.D., Director, has just issued a bulletin dealing with "Recent advances in the construction of electric furnaces for the production of pig iron, steel and zinc." Dr. Haanel, in his introduction, states that the extraordinary rapidity with which the development and perfection of electric furnaces for the production of steel has taken place in recent years is manifested by the fact that while in 1904, six years ago, there were only four furnaces and those comparatively small, in existence in Europe, there are now no less than 67 in operation, 11 built and not working, and 36 in course of erection. A complete tabulated list of the electric furnaces, the world over, is given with the kind of current used, the amount used, the method of charging and the use to which the product is put. For the most part single-phase a.c. is required, but in an appreciable number of cases direct current is used. In only one or two cases is the furance heated with a two-phase or three-phase current. With the exception of the two small furnaces in Canada, at Welland, Ont., eight in the United States and two under construction in Mexico, these furnaces are all situated in Europe.

Nothing has been done in Canada towards the utilization of the electro-thermic process since the experiments at Sault Ste. Marie in 1906. In Sweden, however, where the conditions as regards a plentiful supply of iron ores and a lack of coal, are very similar to those existing in Canada, experiments have been pushed forward and much progress has been made. So far, the best results have been obtained at Domnarfvet, Sweden, where the experiments have been vigorously prosecuted and much capital has been expended. The most recent reports from this point state that further improvements have been made and that, as a consequence an output of 6,283.1 pounds of gray pig iron can be obtained per horsepower year. The report adds that the furnace has been working continuously and acts satisfactorily. A description of the Domnarfvet plant, together with diagrams showing the various designs of furnaces attempted, as well as the latest type developed, is given at length. The diagrams are explained and the chemical processes involved are shown by chemical formulae.

A few pages are also devoted to electric furnaces for reduction of zinc ores. A new process has recently been invented by Messrs. Cote and Pierron, of France, of special design for dealing with composite zinc-lead ores. A diagram of this furnace is given and explained.

Mr. Fred F. Henshaw, of the United States Geological Survey, is quoted as placing the total of the water powers of British Columbia, at low waterflow, at 8,000,000 to 10,000,000 horsepower. By judicious storage this amount may be greatly increased.

Inland Revenues Report on Electric Lights, etc.

The report of the Inland Revenues Department of the Dominion dealing with electric light inspection for the year ending March 31st, 1910, is to hand. The report shows that the total number of electric meters presented for inspection, during the year, in all Canada, was 49,525. Of this number 20,351 were absolutely correct, 16,378 were too fast, 12,718 too slow, but still within the legal allowance of error. In all, 46 meters were rejected.

The total number of electric light companies registered under the Electric Light Inspection Act was 399. The total number of arc lamps in use by these companies was 20,801. The number of incandescent lamps was 2,997,264. The largest number of both types of lamps was that operated by the Montreal Light, Heat & Power Company, being 3,753 arcs and 502,573 incandescents. Other large companies were: Toronto Electric Light, with 1,700 arcs and 300,000 incandescents; British Columbia Electric Railway Company, in Vancouver, with 1,155 arcs and 235,215 incandescents; Quebec Railway, Light, Heat & Power, 988 and 127,640; Ottawa Electric Company, 785 and 189,759; St. John Railway Company, 768 and 33,638; Halifax Electric Tramway Company, 377 and 50,853; Winnipeg Electric Railway Company, 384 and 18,402; B. C. E. Railway Company, in Victoria, 116 and 78,531.

The total amount of power generated by the border companies for use either in Canada or the United States, with the amounts so used, are also given as follows:

Company and Location.	Export in k. w. h.	Canadian Consumption in k. w. h.
Canadian Niagara Power Co., Niagara Falls, Ont.	276,866,417	5,590,383
Elec. Development Co., Niagara Falls, Ont.	22,496,703	101,155,973
Ontario Power Co., Niagara Falls, Ont.	174,116,995	74,853,105
Minnesota & Ontario Power Co., Fort Frances, Ont.	170,100	11,585
Maine & New Brunswick Electrical Power Co., Aroostook, N.B.	1,169,642	42,360
Total	474,819,857	181,653,406

The Copper Situation

There has been a decided improvement in the market during the last few weeks due, in part no doubt, to the avowed policy of the principal producers of limiting the supply until the market shall have absorbed or fairly well caught up with the present production. Commenting on this the Wall Street Journal recently said:

"For the last two years there have been spasmodic buying movements of the metal at different times, but the improvement was not lasting. The various selling agencies and producers would sell, say, from 100,000,000 to 150,000,000 pounds within a period of three or four weeks and prices would show a fractional advance, only to return to the old level when consumers had satisfied their requirements. A month or two later the buying movement would be repeated, but at no time did consumers show a disposition to purchase for future delivery.

"The buying movement which has been under way for the last four weeks, has been of a different character than previous buying movements within the last two years. The amount of copper sold has been larger, and prices for the metal did not recede as buying diminished. Besides, more copper has been taken for future delivery than at any time since the first of the year. In previous buying movements consumers realized that as long as production continued on the increase there was no danger of copper advancing beyond the 13-cent level. Now that they are convinced that producers in this country, as well as abroad, are determined to limit production they are more disposed to buy copper for future delivery.

"Actual production of copper in the United States, Canada, Mexico and South America over the last four weeks has been at the rate of approximately 1,300,000,000 pounds a year, whereas before the policy of restriction was adopted the output was running at the rate of 1,500,000,000 pounds a year.

"Sales of copper in the current buying movement aggregate a total of between 200,000,000 and 250,000,000 pounds. While buying is not as pronounced as it was a short time ago, still sales are fairly large. Producers and selling agencies now have very little copper to sell for delivery before January 1st, 1911, and by that time they believe the metal will be selling well above 13 cents. Deliveries of copper this month have been large and the consensus of opinion is that a further reduction in stocks will be recorded. The reduction this month will be due more to increased deliveries than curtailed output as it will be well into October before the 15 per cent. reduction in production will be reflected in the copper producers' figures. As is generally known the figures of the association are based on refinery output, not the actual production of the mines."

Electric Steel Refining

At a recent meeting of the Iron and Steel Institute at Buxton, England, an interesting paper on "Electric Steel Refining" was presented. It was said that the use of electricity for the refining of steel had now taken its place amongst established metallurgical processes. The electric furnace was at present used in various works for the refining of steel for the Bessemer converter in the manufacture of rails and all classes of railway material and castings, and more commonly in connection with the basic open-hearth process, for the manufacture of various products of intermediate quality, castings, and tool steel of all kinds. The refining of steel that had been previously melted was the first use to which the electric furnace was applied commercially, but now that single furnaces had been producing over 200 tons a day for more than sixteen months, it was obvious that the field for the process had widened, and already many furnaces were in construction or in operation in this country.

The opinion was given that the electric furnace was especially suitable, and would be widely adopted for any class of work in which raw materials of a high degree of purity were used. A wider application for rails and sections might occur when working in connection with the Talbot furnace, for the charge could be taken to the electric furnace as soon as the carbon was down, and the necessity of removing the sulphur and getting a teeming heat was avoided, as this was done in the electric furnace economically and completely. Thus the capacity of the Talbot furnace was substantially increased, and this covered the greater cost of electric refining.

The question of the cost of applying this process, which must be considered before all others, was more difficult to discuss generally, owing to the variety of conditions. The following were the chief points, all of which must be carefully considered in each particular case:

1. The possibility of saving in cost of raw materials, since the best qualities of steel could be made from impure raw materials.

2. Possibility of increasing the output of present furnaces by the addition of electric furnaces with improvement of product.

3. The cost of power and possibility of using the blast furnaces or coke-oven gas, exhaust steam, etc., would be the determining factor in regard to deciding whether, in the manufacture of steel, electric refining could be economically adopted.

4. The possible reduction of capital expenditure at certain

works where the present products were not sufficiently good for modern specifications.

In a further paper which was read before the meeting on the "Utilization of Electric Power in the Iron and Steel Industry," it was said that for some time past, serious attention had been given to the most economical manner of utilizing blast furnace gases for all processes in the manufacture of steel which require mechanical energy. Economical utilization necessitated centralization of the power, for which electricity furnished the most efficient and convenient means. By the centralization of the power production in an electrical central station, it was possible to deliver superfluous quantities of gas for which there was no use in the plant itself, to outside consumers in the form of electrical energy. This might prove a means of increasing the income of the steel works. There already existed several steel works which supplied neighboring towns with light and power from this source.

Automatic Fire Detector

A test recently made in one of the Government Buildings at Ottawa has called attention to the vigorous campaign now being conducted by the Montauk Fire Detecting Company of Canada, to advertise their patent fire alarm device. This article, although on the market for several years past and the subject of high approval from competent authorities, has so far been little advertised in this country and hence not very well known. Its simplicity, efficiency and comparative cheapness, however, should assure a large demand for it, in view of the ever-increasing exacting requirements of the Fire Underwriters' Association.

The patent Montauk wire is essentially a double conductor, suitable insulation being placed between the two metallic surfaces. The core of the conductor is copper; around the copper is a cylinder of highly fusible metal; this in turn is covered with fine cotton braid completely saturated with ozokerite composition; outside of this again is a series of fine tinned copper wires, of the same conductivity as the core and spirally wound; over all is placed another coat of insulation consisting of cotton braid saturated with ozokerite composition. This latter is waterproof, but readily inflammable.

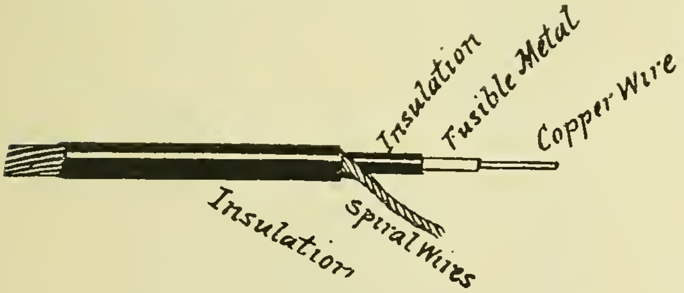


Fig. 1 —Construction of Detecting Wire Illustrated

The metal of low melting point which surrounds the inner copper core also has a high expansion coefficient. As a consequence a slight heating of the compound conductor melts the cylinder surrounding the inner core and also expands it to such an extent that it squeezes through the enclosing coating of cotton and comes in contact with the outer winding of tinned copper wires. In this manner the conductor is short circuited and a signal given. The construction of the wire is further illustrated in figure 1.

The simplest method of inserting the detecting wire is shown in figure 2, which represents two ordinary annunciator wires on open circuit connected by a short piece of double conductor wire as shown, the inner core of the double conductor being connected to one side and the outer spirally wound wire to the other side of the battery. The fusible metal of the central core is made in two grades, one melting at 160 degrees Fahr., the other at 370 degrees Fahr. At extra hazardous points the ordinary annunciator wire is often replaced by the 370-degree double conductor. In such cases, however, the 200-degree wire is generally arranged as a thermostat as shown in figure 3; this arrangement is all the more effective since coiled wire, as shown below, gives more rapid results.

Ordinary annunciator batteries or dry cells are used as the source of energy, one pole being connected to the core and the other to the spirally wound conductor. The bell and indicator panel are then connected as in ordinary annunciator work. For buildings of considerable size, the wiring is done in sections, each room having its own indicator number. The closing of the circuit, due to excessive heat, as above described, immediately results in the ringing of the bell and the appearance of the indicator number corresponding to the seat of trouble. Mechanical injury sufficient to cause contact between the conductors will, of course, indicate trouble in the same manner, thus ensuring working conditions in the apparatus.

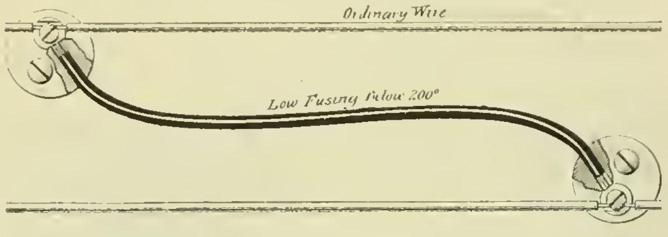


Fig. 2—Simplest Method of Inserting Detecting Wires

A short piece of No. 22, 160-degree wire was recently tested by applying a lighted wax taper to it, and the circuit closed out, giving the alarm, in the average time of 6½ seconds after application of the flame. With the 370-degree wire, tested similarly, the alarm was given in the average time of 15 seconds.

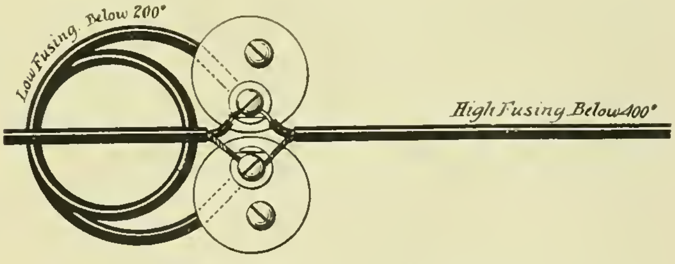


Fig. 3 Low Temp. Fuse Wire Thermostat

The following results were obtained from a series of tests made recently at Montreal:

Style of wire.	Temperature of oven at start.	Temperature at which circuit closed.	Time in oven.		Time to reach rated temperature.		Time to close circuit after reaching rated temperature.
	Degs.	Degs.	Min.	Sec.	Min.	Sec.	Sec.
Wire 370 deg. F......	125	382	6	50	6	15	35
Thermostat 300 deg. F	90	365	6	34	6	24	10
Wire 160 deg. F......	100	185	1	50	1	20	30
Thermostat 160 deg. F	75	195	2	06	2	00	06

The breakdown pressure between conductors is 750 volts.

Bergmann Generators for Cement Co.

The Vancouver Portland Cement Company have awarded to Chapman & Walker, Toronto, the contract for the installation of two 300 h.p. 2-cylinder Crossley gas engines, two 400 h.p. soft coal producers (the extra gas supply will be used for heating purposes) and two 220 k.w. 600 volt, alternating current Bergmann generators.

Ice Troubles in Water Power Plants

At a recent meeting of the Ottawa branch of the Canadian Society of Civil Engineers, Mr. John Murphy, electrical engineer for the Department of Railways and Canals, gave a paper on ''The Ice Question, as it Affects Canadian Water Powers,'' which should be of interest to all connected with the operation of hydraulic plants in Canada, particularly at this season of the year.

Frazil and Anchor Ice Defined.

In his lecture before the Civil Engineers, Mr. Murphy first pointed out the difference between ''frazil'' which causes power plant troubles and ''anchor'' ice which does not. ''Anchor'' ice, which is feathery or wooly in appearance, forms on rocks in the bottom of the river, remaining there by virtue of its adhesive qualities and not because of its weight, as it is lighter than water. The only way in which anchor ice can cause trouble is to accumulate from below until it forms a dam, retarding the flow of the water. ''Frazil,'' on the contrary, floats on the surface and resembles anchor ice only in its adhesive properties. It forms only when the sun is not shining and in water having a rough or choppy surface, due to the action of wind, rapids or other cause. What would be sheet ice on a quiet water surface, becomes ''frazil'' on a broken surface. Ideal conditions for the formation of ''frazil'' are: a dark day, a fresh breeze, particularly of the northwest variety, at an air temperature several degrees below freezing, and a water temperature at, or within a fraction of a degree of, the freezing point. This spells ''trouble'' in big letters for the power plant man, and rakes, poles and similar appliances are in great demand. It can readily be seen that with a cold wind blowing, a plant at the lower end of a lake or power canal is open to trouble from ''frazil'' as well as one situated at the foot of a fall or rapids.

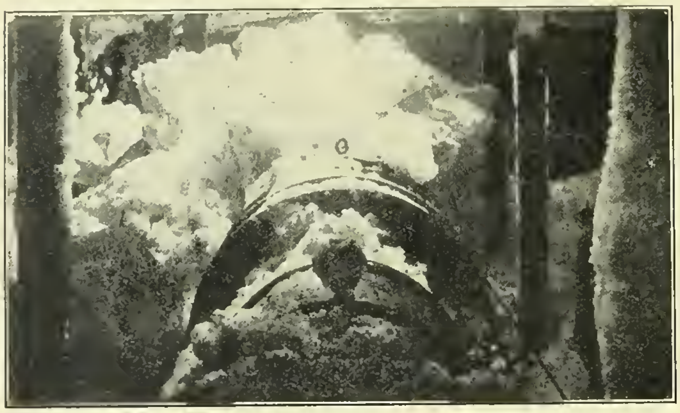


Fig. 1

How Frazil Ice Gathers.

The frazil is carried along with the water entering the forebay of the power plant and is dashed against the racks—generally of iron—protecting the mouths of the penstocks. It here exhibits its adhesive qualities to the full and sticks like glue. More coming behind clings to what has arrived first, and in a very short time the spaces between the bars of the racks become completely clogged up and still the frazil keeps coming. In this state it becomes packed by the force behind it, forming an imperviable dam, and a ''shutdown''—the bugbear of the power plant man—inevitably follows. See fig. 1. This, despite the efforts of willing workers to shave, chop or rake it away, for the supply will be continuous until the sun shines again or the wind dies down. Again, even if the frazil is not being formed in sufficient quantity to clog up the racks, it may flow on down the penstock to get in its deadly work on the controlling gate of the turbine or waterwheel. Then there is an uncontrollable runaway turbine to deal with and the last condition of that turbine is worse than the first.

Why Frazil Ice Gathers.

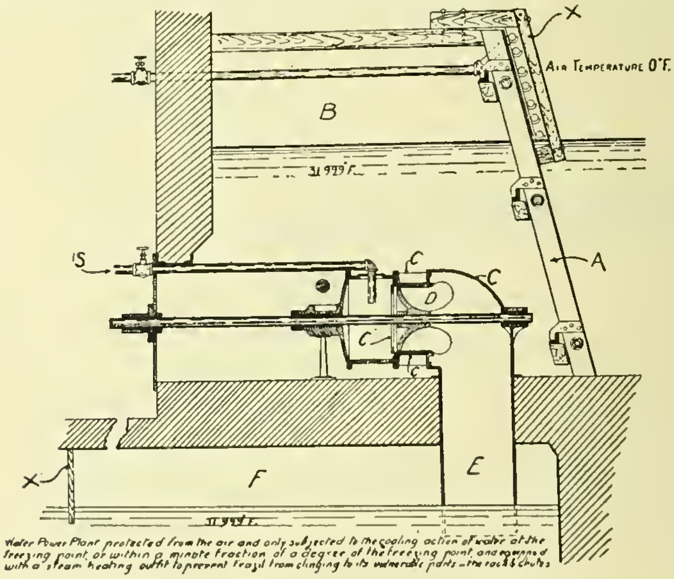
Scientific investigations conducted by Dr. H. T. Barnes, of McGill University, and published by him in a work entitled ''Ice Formations,'' established the fact that a drop of a few thousandths of a degree below the freezing point in the water temperature is sufficient to cause the formation of ice in the shape of frazil, while an increase of like amount, such as would result from the heating effects of the sun's rays, will do away with this condition. He also showed that no matter how low might be the air temperature, that of the water remained within a small fraction of a degree of freezing point.

But it is not necessary to raise the temperature of the water to obviate frazil troubles. Mr. Murphy has found that frazil will not cling to racks of which the iron has a temperature even a small fraction of a degree higher than that of the water. Left alone, these iron racks, which have a thermal conductivity many times greater than that of the water and which project a considerable distance into the air which is at a much lower temperature, form an excellent ice-making plant throughout that part of their length which is below the water level. Inevitably the finely divided frazil clings to them and freezes solid. The same condition obtains at the controlling gate of the water wheel, if it is not protected from the outside air—and most of them are not.

How to Prevent Frazil.

To render impossible, then, the formation of quantities of frazil at racks or controller gates, it is necessary to keep them at a temperature very slightly above that of the water. This can be done by protecting them as much as possible against the chilling action of the outside air and applying heat to them. This can be most conveniently done by the use of steam, though electrical heating is also practicable. It should be applied directly to the racks and to the chutes as these are the points most amenable to the attacks of frazil. See fig. 2. To produce sufficient steam to keep a 3,000 h.p. hydro-electric station free from frazil, one ton of coal per twenty-four hours would be required. The amount of coal required to operate a 3,000 h.p. steam station would be about one hundred and forty-four tons, proof enough of the economy of using an ice-combatting equipment such as this.

Mr. Murphy has been a pioneer in this line of work and has persevered in grappling with the problem in spite of adverse criticism from hydraulic men and others, but has had the satisfaction of arriving at a successful solution. His success is attested to by the fact that the plants of the Ottawa Electric Company and others around Ottawa, although they have steam-heated only their turbines and controller gates, and not the racks, have not had one shut down due to frazil since putting Mr. Murphy's plan into practice. And all this in the face of the fact that they are situated on a site ideally suited to the production of ice troubles, having no less than three rapids within five miles upstream. Previously, shutdowns were as regular as the winter, despite tremendous exertions on the part of husky gangs of ice-rakers.



Water Power Plant protected from the air and only subjected to the cooling action of water at the freezing point or within a minute fraction of a degree of the freezing point, and equipped with a steam heating outfit to prevent frazil from clinging to its vulnerable parts—the racks & chutes

Fig. 2

Conservation of Water Powers of Canada

The work of the Conservation Commission—Estimates for Ontario and Quebec—Bill to be introduced at next session—Probable text of the act.

F. D. Monk K. C., M. P.*

It has occurred to me that I might possibly interest you in laying before you a plain statement of what has been done during the last half a dozen years to react against the profligate waste of our great national wealth and what remains to be done in order to husband and economize our resources in such a way as to ensure their maintenance and renewal for the best interests of the future generations and of the nation at large.

On the 3rd of October, 1907, the Commission of Inland Water Courses of the United States addressed to the President a memorandum in which it was established that the time had arrived for the adoption, throughout the American Republic, of a national policy of conservation, and it advised the Chief of the Executive to convene at the White House the governors of the different States of the Union, in order that this particular policy should be discussed and studied.

In consequence of this memorandum, the President convened the conference suggested and it met in May, 1908. The meeting was a most important one. Not only governors, but members of the American Cabinet, of Congress, judges of the Supreme Court and many distinguished scientific men attended the meeting. The conference formulated important principles in relation to conservation and it invited the federal as well as the state governments to take steps in execution of the policy that had been laid down. Subsequently, a national commission of conservation was named for the purpose of inventorizing and taking measures to preserve the natural resources of the country.

In view of what had been done in the United States, President Roosevelt, realizing that the conservation of natural resources on this continent could not be carried out without the co-operation of Mexico as well as of Canada, invited delegates from both these countries to meet in Washington for a North American Conference of Conservation. Again these delegates from the three countries united together, laid down a policy and made a declaration of principles applicable to conservation throughout the Continent, and after our own Canadian delegates had returned from Washington and reported what had taken place, our own Government, in the year 1909, decided to establish in our own country a Commission of Conservation of Canadian Natural Resources and gave effect to this decision by a law known as Chapter 27 of 8 and 9 Edward VII., sanctioned on the 19th of May, 1909, and creating a Commission of Natural Resources, perhaps the most important body of the most representative character that we have had in Canada since Confederation.

The duties of this new body are summed up in section 10 of the Act just referred to; they consist generally in the complete study of all questions which may be brought to its attention regarding the conservation and the proper utilization of the natural resources of Canada, preparing inventories, gathering and disseminating information, conducting enquiries, in as well as outside of Canada, concerning our natural wealth, and formulating opinions and desires respecting the proper care of all the material resources disseminated throughout the entire land.

The commission has an absolutely representative character. Certain members are ex-officio in the commission; twenty are named by the Governor-General in Council and remain in office during pleasure; the Minister of Agriculture, the Minister of the Interior, the Minister of Mines and the Member of the Provincial Government in each province of Canada specially charged with the administration of the natural resources belonging to the province form part of this commission. Among the members to be designated by the Governor-General in Council, one must be named from each province who is a member of the faculty of a university in the province, if the province has a university.

The services of the members of this commission are gratuitous, they are paid their travelling expenses only.

During the autumn which followed the adoption of this important law, an Order in Council was passed on the 3rd of September, 1909, giving effect to the new statute and naming the persons who are to form part of the new body. Thirty-three members were named to begin the important work which the commission was about to undertake; many, of course, belong to the commission by virtue of their official position, as advised in the statute of creation; the other members were chosen by the Government under section 2 of the Act, which provides that outside of the ex-officio members twenty others are designated by the Governor in Council to remain in office during pleasure. I was among these latter, and, ever since the commission has begun its work, I have felt a very great interest in all its proceedings, realizing that its creation was not only a necessity, but that if it fulfils the object of its organization, it will render a very great service indeed to our country where the subject of the conservation of our forests, water powers, agricultural resources, fisheries, mines, game, and indeed all that we have been endowed with so generously, has become an absolute necessity in view of the growth of our population and the utilization, as daily it becomes better known, of all the wealth there is in our country.

At the first meeting of the commission, on the 18th of January this year, in the Carnegie Library, Ottawa, the Hon. Clifford Sifton, named chairman of the new commission and who has undertaken these important duties with all the energy that characterizes him, gave us a most interesting lecture on the duties and responsibilities of the new body. The commission, under the terms of its statute of creation, was empowered to create within itself committees in connection with the different subjects within its jurisdiction and it organized in consequence as follows: a committee on fisheries, game and fur-bearing animals; a committee on forestry, a committee on mines, a committee on minerals, a committee of the press and co-operative organizations, a committee of public health, a committee on waters and hydraulic forces. Although I was ill at the time and unable to attend the committee on waters and hydraulic forces in which I was placed together with Hon. Jules Allard, representing the Government of the Province of Quebec; Hon. Frank Cochrane, representing the Government of the Province of Ontario as Minister of Lands and Mines in that province; Hon. Price Ellison, Commissioner of Crown Lands in the Province of British Columbia; Hon. W. C. H. Grimmer, of the Government of New Brunswick, and Mr. C. A. McCool, M.P., they did me the honor to nominate me as chairman of the committee, and I have since that time endeavored to fulfil the duties attached to that position in such a way as to justify the confidence thus placed in me.

Figures, as a rule, are not very interesting.

In this instance, however, I am sure you will be pleased and surprised to hear the latest figures compiled by our engineer, Mr. Denis, relating to the water powers we have around us.

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*An address recently delivered before the Caledonian Society, Montreal

It is the result, in part, of his summer's strenuous labors and I have just obtained them from him:

Aperçu of Water Powers in Ontario.

The total estimated water powers in the different districts of the Province of Ontario may be summarized as follows, the h.p. being estimated for the low water period:

Trent river and district	66,000 h.p.
Lake Huron and Georgian bay district	60,000 h.p.
Ottawa Valley and St. Lawrence river district	946,000 h.p.
Algoma and Thunder bay district	301,000 h.p.
Rainy river district	196,000 h.p.
Niagara river	425,000 h.p.
Northern Ontario	1,730,000 h.p.
Total	3,724,000 h.p.

This total represents the amount of power to which the province has right; 50 per cent. having been deducted on all boundary streams, except on the Niagara river, for which there are special provisions.

Niagara.

The total amount of power which could be developed here by using all the water and drying up the falls has been estimated at over a million and a half horse-power.

By an agreement of the International Waterways Commission, the amount of water allowed to be used for power purposes on the Canadian side must not exceed 36,000 cubic feet per second, which means approximately 425,000 h.p.[1]

Northern Ontario.

The water powers of this district have been carefully investigated by Mr. L. V. Rorke,[2] Inspector of Surveys for Ontario.

A summary of his estimates may be tabulated as follows:

Rivers	Total height of the different falls.	Possible h.p.
Abitibi, Black and Frederick House	451 feet	359,000
Mattagami, Ground Hog and Kapuskasing	830 feet	394,000
Missinabi and Opazatika	534 feet	292,000
Kabinakagami and Kenogami	486 feet	99,000
Ogoke	170 feet	216,000
Winnipeg and English	91 feet	370,000

Giving a total aggregate of 1,730,000 horse power for this district.

Aperçu of Water Powers in Quebec.

The water powers of the Province of Quebec, on which definite information is available, may be grouped as follows:

North shore between Ottawa and St. Maurice rivers (including both these rivers)	777,000 h.p.[3]
North shore between Batiscan and Saguenay rivers (including both these rivers)	737,000 h.p.[4]
North shore below Saguenay river	1,737,000 h.p.[5]
South shore, Chaudiere river and below	58,000 h.p.
South shore above Chaudiere river, including the St. Lawrence above Montreal	167,000 h.p.

This gives a total of 3,476,000 h.p. but does not include the water powers in the Abitibi. An estimate of the water powers of this region shows a total of about 242,000 h.p. on the Nottaway river, and a total of about 128,000 h.p. on the Rupert.

Water Powers Around Montreal.

The following is a resume of the most important water powers within 100 miles of Montreal.

St. Lawrence River.

The Galops, Cardinal and Iroquois Rapids are estimated at a minimum of 232,000 h.p., using the whole flow of the river; the Rapide Plat at 170,000 h.p., and the Long Sault at 618,000 h.p., on the same basis. However, these are on an international stream, and, allowing 50 per cent. of the water to be used on the United States side, our share of the power available at each of these rapids would then be:

Galops, Cardinal and Iroquois	116,000 h.p.
Rapide Plat	85,000 h.p.
Long Sault	309,000 h.p.

At the Coteau, Cedar and Cascades Rapids, by damming the whole river and obstructing navigation through these rapids, it is estimated that 960,000 h.p. could be developed. The total capacity of the Lachine Rapids on the same basis is some 400,000 h.p.

Ottawa River and Tributaries.

When completed, the different works of the Georgian Bay Canal will enormously increase all the water powers on this river, and in some cases, particularly at the back of Montreal, will create large developments where, practically, none are feasible at present.

On the River des Prairies, 46,000 h.p. will thus be created, and at the Recollet dam, 23,000 h.p. will be created.

At Point Fortune, the power available now is 26,000 h.p., this will be increased to 200,000 h.p. by the Georgian Bay Canal.

At Hawkesbury, 23,000 h.p. could now be developed, this will be increased to 94,000 h.p. by the canal.

On the Lievre river at Buckingham, a total of 16,000 h.p. could be developed; only about one-half of this is at present utilized. On the same river, at High Falls, 40,000 h.p. could be obtained.

Other Rivers.

On the Richelieu river is the well known development at Chambly, giving some 20,000 h.p. On the same river, at St. Ours, about 2,500 h.p. are available; and the new government dam, 7 miles below St. John's, will create a development of about 3,500 h.p.

On the St. Maurice, Shawinigan Falls can give over 100,000 h.p., and the falls at Grand Mere, about 21,000 h.p.; both these are only partly utilized at present. Other water powers on the same river are: La Gabelle (8,000 h.p.); Grandes Piles (23,000 h.p.); and Les Hetres (7,000 h.p.)

On the Batiscan, a total of 10,000 h.p. could be obtained, distributed over five or six power sites on this river. Then, coming nearer Montreal, on the north shore we have four sites on the Riviere du Loup, in Maskinonge County, giving a total of over 5,000 h.p. The Ste. Ursule Fall, on the Maskinonge river, with 4,000 h.p.; the Mont a Peine Falls, on L'Assomption river with over 2,000 h.p.; and the Darwin and Manchester Falls on the Ouareau river, where nearly 5,000 h.p. could be developed.

It is evident that in the presence of such untold wealth of water power, a great temptation exists for those interests in availing themselves of it, to acquire and use it as cheaply as possible.

The aim of such a commission as ours ought therefore to be such a regulation and control of our hydraulic wealth as to economize it, get for the people at large as great a return as possible for these powers, and make them an increasing source of revenue for our national exchequer as possible, while encouraging development and making its user as advantageous as possible for the public generally.

The commission, at its first gathering, in view of these primal considerations, unanimously made the following recommendations:

1. That any water power alienated should be developed within a specified time.

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[1] Third (1906) Report, Canadian Section International Waterways Commission, p. 140.

[2] See Canadian Electrical News, July, 1910.

[3] Only includes 50 per cent. of total power on the interprovincial portion of the Ottawa river.

[4] A report by Mr. J. C. Langelier gives an additional 300,000 h.p. (which is not included in this total), on the Chamuchuan river.

[5] This total is based on the average flow of the rivers in the district. The total for the average minimum flow would be about 500,000 h.p.

2. That there should be a public control of rates.

3. A rental with the power to revise the same at a later period.

Since some years, these varied and magnificent powers have attracted to no small degree the attention of far-seeing capitalists.

As we have no legislation upon the subject, alienations have taken place under conditions which, if persisted in, would undoubtedly lead to the dilapidation and waste of national wealth.

In many cases, these alienations lie dormant and undeveloped, the owners merely waiting for some speculation destined to enrich them to the detriment of the Canadian people.

It seemed therefore, that our committee, in its opening labors, could not do better than prepare such legislation as might be acceptable to Parliament and ensure, at once, the conservation or salvation of this incalculable national asset and so regulate the user of our powers as to ensure to the whole people, and not to a few only, every possible advantage derivable from them.

Commission Framing a Law

We have therefore framed a law having this end in view and the Committee on Water Powers will take the matter up as soon as it meets in Ottawa, in January. We will also introduce our bill into Parliament without delay, so that the House may have time to carefully consider its provisions.

We will confer with the Government and endeavor to secure its concurrence in the proposed measure. No doubt that when this important matter has obtained the approbation of the Cabinet, it will become a ministerial measure and, before the end of the session, we will have upon our statute books such legislation as will assure the conservation, for all time, of this great national asset, and so regulate its development and use as will make our people feel certain that our water powers will from now on be a great and increasing source of revenue, and, by the strict control of rates, be within reach, on reasonable terms, of all who wish to avail themselves of them for its multitudinous uses.

Legislation, then, is the foremost object; then a careful inventory of what this source of wealth consists in.

Our commission, though the sum placed at its disposal is very modest indeed, has done its best to wisely provide in the first instance for what seemed essential.

Of our staff I cannot speak too highly. Our secretary, Mr. James White, formerly Dominion Geographer, has proved, as we had good reason to anticipate, the right man in the right place, and too much praise cannot be given to him for the systematic manner in which he has organized our work and obtained astonishingly satisfactory results with the meagre resources at our disposal. My own dealings have been largely with Mr. Denis, our hydraulic engineer, whose talent and industry have obtained for us, in a short space of time, a very comprehensive estimate of Canadian water powers, which estimate clearly demonstrates how useful the commission must prove, even if its activities were limited to this feature only of the great mission to which we have been called by the Government.

Main Objects of Bill

Permit me to say, without entering into details, for the bill in preparation has not yet been discussed by the commission, nor has it yet received the sanction of the Government that the law in contemplation has for its main objects:

1. The alienation for a stated period only of any water power under the control of the Dominion;

2. The reference, before alienation, of any application for such power, to the Conservation Commission for its examination and a full report thereon;

3. The determination of the development to be made, of the right of entry to be paid, and of the annual rental to be paid to the state calculated upon the quantity of power utilized;

4. Time within which proposed development is to be made and forfeiture in case of non-observation of the conditions and revision of rentals at the expiry of each period of user;

5. Indemnification of lessee in case of failure to agree after each period;

6. Control of rates upon which the public at large is to be supplied with electric power by the lessees;

7. Jurisdiction to determine differences between the government and lessees in case of failure to agree in some independent tribunal.

It seems necessary also, I may add, for parliament to put an end to all alienations so far made of valuable power sites where the interested parties have failed to observe the conditions under which such alienations have taken place.

Such are, in a very general way, the efforts which we are trying to put forth in favor of a cause, one of the worthiest surely, of public attention and endeavor, at the present moment, a cause which seems deserving of the encouragement and support of every Canadian public spirited citizen.

The subject is new and few countries as yet have dealt with it by legislation. The field itself is new, and we are only at the dawn, so to speak, of the day of water power possibilities.

Switzerland is the most advanced country in regard to water power legislation, at the present time, but our neighbors are following close upon the traces of the Helvetian Commonwealth. We all know how difficult have been rendered the conservation efforts made in the United States by the selfish interests that are so powerful there.

Let us hope that in our own country endeavors will be more readily responded to and, with the assistance we have a right to expect, we will be able to guard by wise measures our vast national resources from spoliation and waste for the people of our own coutnry.

Electrical Plants of the United States

The Central Electric Light and Power Stations of the United States is the title of a comprehensive volume just issued by the Bureau of the Census of that government. The remarkable growth of the light and power industry is shown in the fact that the cost and equipment of such stations represented $1,096,913,622 in 1907, or double that of 1902. The horsepower capacity more than doubled—4,032,365, against 1,830,594, while the output of stations in 1907 was 5,862,276,737 kilowatt-hours, against 2,507,051,115 in 1902. The number of incandescent lamps in use in 1907 was 45,991,836, against 19,636,729 in 1902, and of arc lamps 635,815, against 419,561. The incandescent lamp has largely superseded the arc lamp for street and other lighting purposes, since it has been found that better service is secured by the distribution of a larger number of comparatively small lamps.

A comparison of the number of reports received from municipal stations in 1907 with the number received in 1902 shows an increase of 53.6 per cent. as compared with 23.4 per cent. for the commercial companies. The municipal stations are practically exempt from the consolidations that so frequently occur among commercial companies, and this fact no doubt accounts in large part for the proportionately greater increase in the former class of stations. Not only was there a large increase in the number of municipal stations, but an analysis of the reports shows that although 33 municipal stations which reported in 1902 had become commercial stations in 1907, 113 stations which were reported as commercial in 1902 had become municipal in 1907.

The claim has been made that the drift of these public utilities is from municipal to commercial, but the results of the census do not furnish corroborative evidence of this. On the contrary there appears to be a distinct field for municipal electric stations, not only because of a feeling which may exist in many localities that these public utilities should be owned by the cities, but because many of the places in which municipal plants are located do not present sufficient inducement for the investment of commercial capital.

Ornamental Street Lighting in Hamilton

Business Streets Brilliantly Illuminated—Ornamental Street Standards Surmounted by Tungsten Clusters—Public Appreciative of Company's Efforts—Special Design for Park

Hamilton has been often called the "Electric City of Canada," in virtue of her cheap electric power, and the extended uses to which it has been put in public and private lighting, and the operation of factories and railways. The Hamilton Electric Light & Power Company, Limited, is a corporation enjoying a public franchise for carrying on the sale of electricity in the city of Hamilton and vicinity, and has considered it a duty, as well as sound financial policy, to do all in its power to enable the city to justify its possession of this title. Taking as a motto "Electric Service at the Minimum Cost," this corporation has been alert in introducing all that is new and valuable in electric progress, in the firm belief that in persuading the merchant to use an electric sign or to improve his private lighting, in assisting the Commissioner of Industries to secure new factories for the city, assuring low rates and conscientious service for electric power as an incentive, and in a general way by promoting the use of this most utilitarian of the servants of mankind, they would not only best serve the interests of their stockholders, but equally the public from whom they derive their franchise rights.

The numerous installations of decorative street lighting, popularly called "White Ways," that have been put up in the United States within the past few years have naturally not escaped the attention of Canadians, and last spring the time seemed ripe for Hamilton to take her place in the line of progress in public lighting. With a desire to benefit to the greatest possible extent by the experience of our neighbors over the line, correspondence was opened with representative central stations throughout the States, and the company sent a representative to the convention of the National Electric Light Association at St. Louis to still further investigate the matter. By the end of June the investigation had proceeded far enough to justify taking definite steps to give Hamilton a "White Way" of which her citizens might feel proud.

Ornamental lamp standards surmounted by clusters of tungsten lamps, in diffusing globes, were decided upon as the preferable means of illumination. The lighting standards selected by the company are made of pressed steel and represent a unique and interesting development in ornamental street lighting specialties. This patented invention makes the construction of a tapered, fluted column or support from sheet metal a possibility for the first time, and lends itself admirably to the manufacture of lamp standards requiring classical lines and clean-cut, graceful contours. A sheet of steel of sufficient gauge to insure perfect strength is formed into a plain tapered column of proper architectural proportions. Another plain column of same size and shape, constructed of special non-oxidizing steel, is forced inside of the first. By means of patented machinery the double tapered column is then fluted in accordance with either the Doric or Corinthian orders of architecture. The double thickness of material, together with fluting, increases by several times both compression and lateral strength. Double thickness No. 22 gauge high carbon, non-oxidizing steel is employed in the manufacture of these standards. This construction carries with it sufficient strength for all purposes, yet does away with heavy shipping charges and great weight and difficulty in erecting the standards.

The business centre of Hamilton including about twelve blocks on either side of King street, and six blocks on either side of James street, was chosen as the portion of the city to be illuminated with this extra lighting. Figure 1 is a view of the City Hall, showing the lamp standards in place, and also an electric sign which expresses the real feeling of every Hamiltonian toward the stranger or returning citizen. Figure 2 represents a night view, looking east on King street east. Figure 3 is King street looking west, by day. Just imagine what the appearance of this street would be if all wooden poles were removed and wires carried underground. The standards are equipped with four 100-watt tungsten lamps with diffusing globes, on the arms, and one 125-watt lamp in the central globe. As all the lines are overhead the circuits for these standards are run from transformers situated in the centre of each block. The circuits contain three wires, and are run down the pole on which the transformer is located, in conduit, to the nearest standard, and from there distributed to the different standards in conduit placed about three inches below the surface of the pavement near the

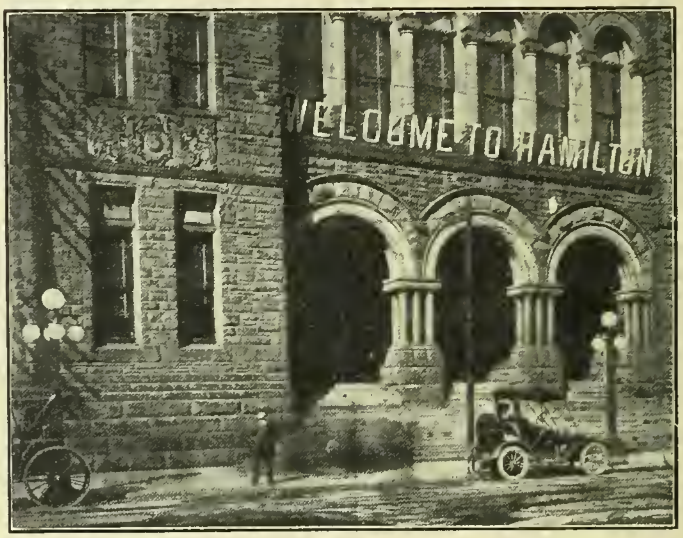


Fig. 1—Metal Standards and Electric Sign, Hamilton

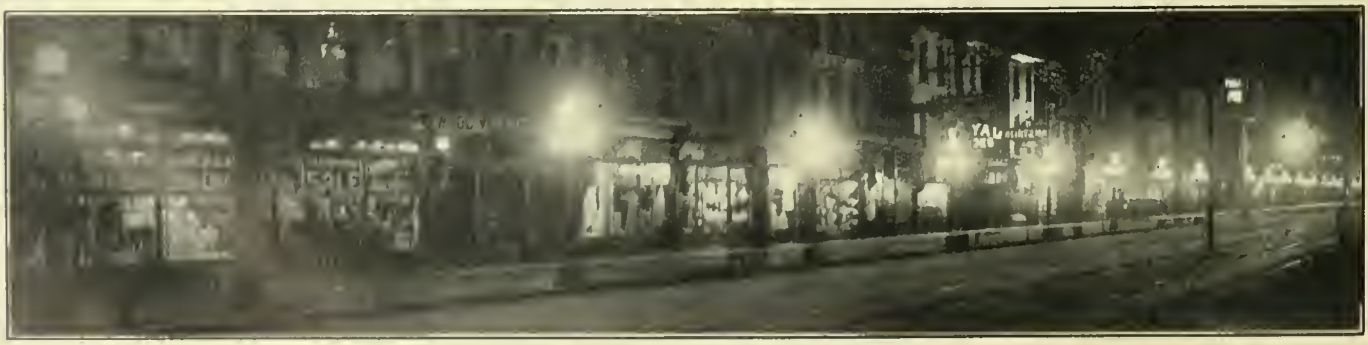


Fig. 2—Hamilton's Street Lighting System—King Street East by Night

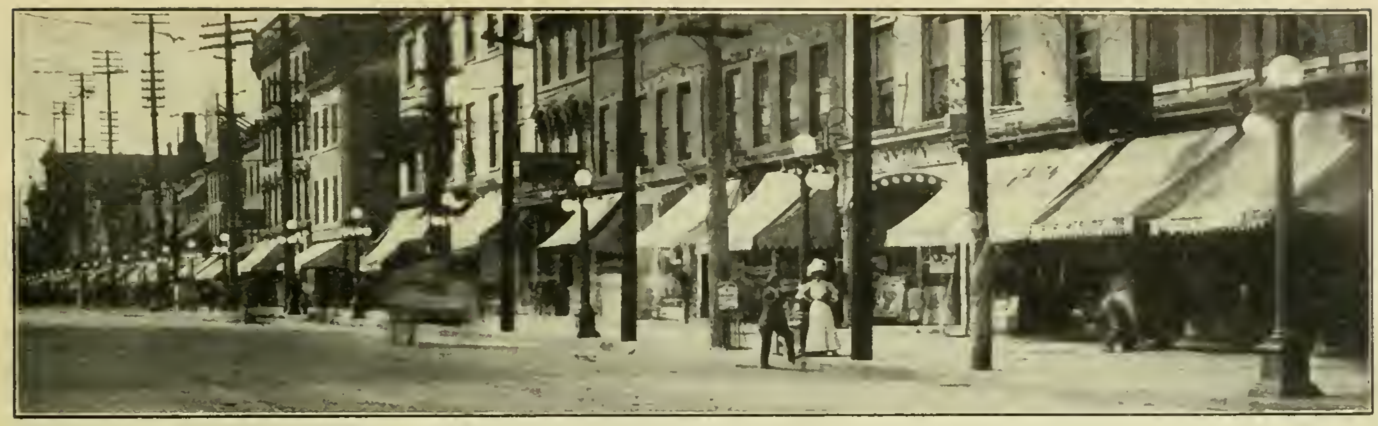


Fig. 3—Hamilton Street Lighting System—King Street West by Day

curb. The lamps of each block are controlled by a switch placed on the base of the standard nearest to the transformer pole. The three-wire system was used so as to permit of the central lamp being run all night, should this be later required by the city council.

The method adopted by the Hamilton Company of creating public interest and securing this special public lighting system may be of interest to the commercial departments of other central stations. They first decided upon the form of proposition to be presented to the merchants, which was as follows: It was proposed by the company that, at their own expense, they should erect standards at each street corner, with others at equal distances between of approximately 45 feet; install the standards and maintain them in every way, including painting, cleaning globes, replacing burnt out lamps, etc., and operate the lamps from dusk, by which is meant about a half-hour before the city arcs are turned on, until 11 p.m. each evening, including Sundays. The merchants or property owners were asked to sign a five-year contract to pay for the current supplied on a basis of 12½ cents per month for each front foot of property on the block. The rate of payment was the same whether or not a particular merchant happened to have a standard in front of his property.

The form of the proposition having been determined, the company started to create a public desire for a "White Way." To this end articles were published in all the city papers setting forth the plans of the company, showing what other cities were doing, and telling what they would do if they received the support of the merchants and property owners along the streets selected to become Hamilton's "White Way." Canvassing for contracts, taking the streets up block by block, was then begun, and in less than one month they had closed contracts with merchants and property owners of four blocks. To this end, as soon as the standards had been designed, two were ordered and installed in a block where a representative meeting of the merchants of the block had been held and interest first created. The standards were very favorably commented on, and a vigorous store-to-store campaign on a competing block, was now started, leaving the more progressive ones of the first block to convince their more timid and doubtful neighbors that a "White Way" would be a good thing for Hamilton in general, and for them in particular. As soon as the news was published that the "White Way" was actually started and the standards ordered, the first block was soon signed up and their standards also ordered. Soon after this two other blocks were closed, and then followed contracts for four additional blocks, the standards in which have also been installed. Contracts for lighting eight other blocks have practically been closed at time of writing, and at this rate before the end of the year Hamilton will have a modern decorative lighting system throughout all the blocks in its principal business centre that were originally selected as its electric "White Way."

Besides its prominence as a manufacturing centre Hamilton has the distinction of being one of the prettiest cities in the Dominion, being noted for its broad avenues shaded by maple trees, and its fine park system. A glimpse of one of these beautiful shaded parks, situated in the very heart of the business district, is shown in figure 4. The proposition to install ornamental lighting standards along the business thoroughfares suggested to a number of Hamilton's progressive merchants the idea of presenting similar standards to the city to be installed in this park. This public-spirited offer was gladly accepted by the city, and resulted in thirteen of the standards being installed about the outer edge of the park. These standards are somewhat more ornamental than those used on the streets, the globes being held in the upright position, as shown. The lamps are the same size, but it is the intention to run the central globe all night. As their contribution toward the illumination of this park the Electric Light Company intend to supply the current for the lamps without charge, at least for one year, simply making a nominal charge for the maintenance of the lamps, glassware, etc.

Fig. 4—A Well Illuminated Park in Hamilton

While there may never have been any lack of appreciation on the part of Hamilton's citizens of the efforts of the Hamilton Electric Light Company to give the city good service, and to keep Hamilton to the front as the "Electric City of Canada," the present movement for the "White Way" appears to have been the most popular move they have yet made. Not only have the citizens at large been favorably impressed by the great improvement which this ornamental lighting system has made in the appearance of their city, but the merchants themselves are beginning to realize, as they have not done before, that lighting attracts trade.

New Rolling Stock for Toronto Railway

Adding Twenty New Coaches—Cars are Convertible, Vestibules both Roomy, Brilliantly Lighted—Signal by Push Button—Four 40 H.P. Motors for Each

The Toronto Railway Company is adding to its already splendid service some twenty new coaches of modern design, a description of which is given below. These cars were constructed in the company's own shops and consequently contain many new and distinctively advanced features over the ordinary coach. They have been tried out already over a number of Toronto's busiest streets and have given the greatest satisfaction to operators and patrons alike.

The Frame Work.

The length of car over body is 30 feet; the length over all, 44 feet 9 inches. The bottom framework is of semi-steel construction. The side sill-plates are placed on the extreme outside of the body, reinforced by an angle on the inside, allowing the wheels to curve under it; this angle carries all the cross floor supports which are reinforced by truss-rods in order to take care of the floor load. The posts on the inner side are tapered. The heavy steel construction usually used in supporting large platforms, in this case, is dispensed with. The only steel used is the two outside platform supports, made of light steel on the cantilever principle, reinforced on the bottom side by a light angle. The platform centres are supported by adjustable trusses having their bearing on the bottom of the cantilever under the car-body sill. In this position the weight is taken care of by the ordinary platform suspension bolts.

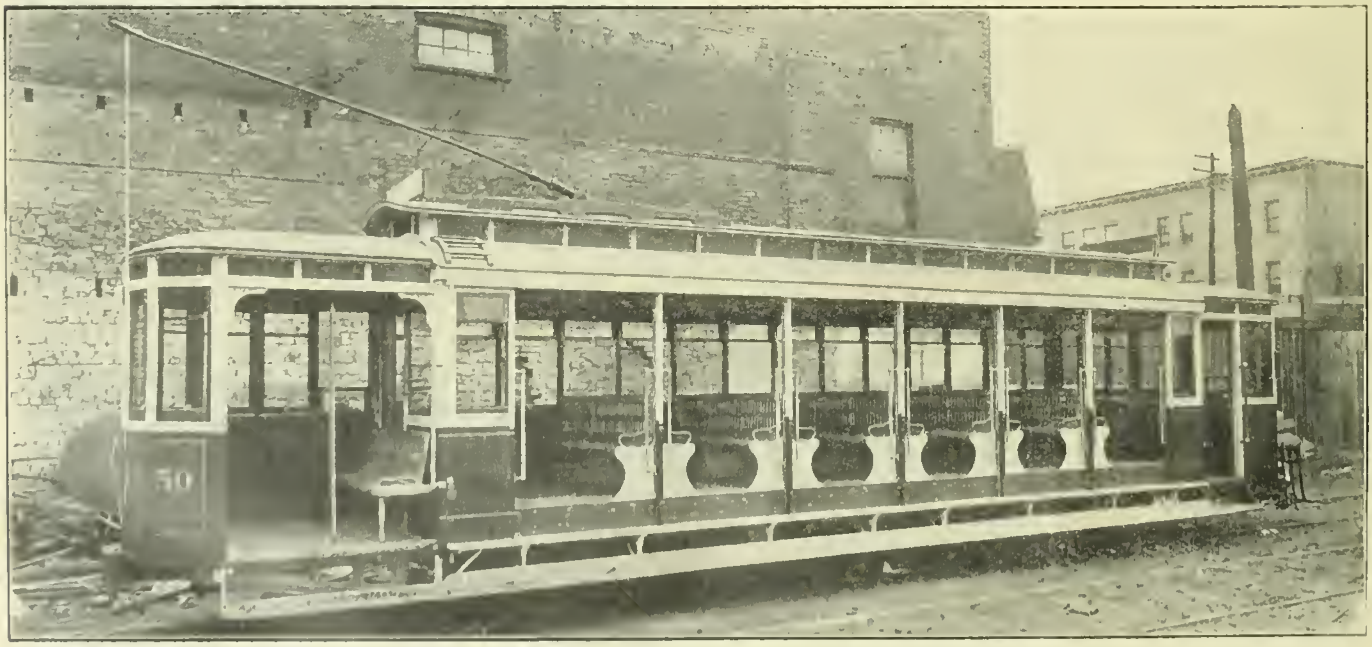
Vestibules.

The vestibule is surrounded by the usual angle bumper placed on the centre of which, and curved to suit, is a piece of the same material bolted securely, about 2 feet 6 inches long, to protect a higher car should they collide. Both vestibules are of the same size. The front is fitted with a wide sliding-door, operated by the motorman, locking each time it closes. Two switch-irons are inserted in the floor over the tracks, alongside of which is placed a metallic frame containing plate glass. This frame is so constructed as to open in order to be cleaned. The object of this device is to enable the motorman to see the switch, and at the same time to prevent the cold from entering the car. This system assures the motorman of his switch-iron every time, and saves the company the cost of replacing lost ones. It may be noticed that a rail is shown behind the motorman which performs a double purpose in separating the motorman from the passengers, and providing a location for the sand box, the lid of which, when open, conforms to a comfortable seat for the motorman. The placing of the sand box in such a position is certain to prevent dampness, and also being in full view of the operator he may see the condition of the sand. Over this rail a blind is suspended from the roof, which can be drawn down to prevent the light of the car from interfering with the view of the motorman. The vestibule is also provided with an outside mirror giving the motorman a clear view of the whole car side. There is only one hand-rail placed on the front of the vestibule for the use of persons alighting, making it almost impossible to get off backwards. The steps are very wide and spacious, having a ribbed lead covering to prevent slipping.

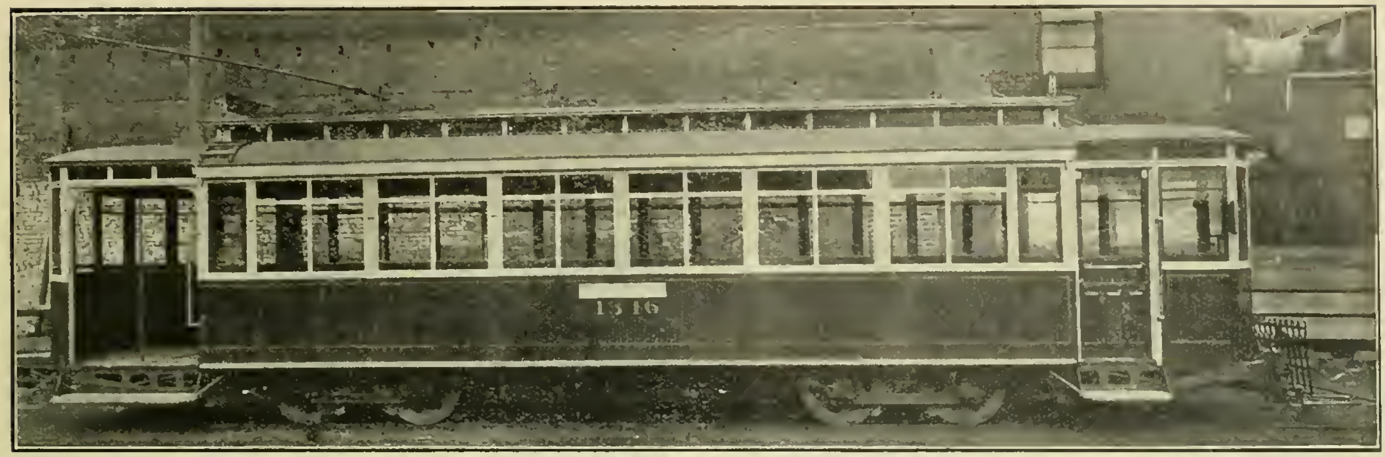
The back vestibule is large, the inside being sheeted upright, having a base well scalloped up from the floor to prevent dampness at the post bottoms. The entrance to the car is large on the inside of vestibule, making it very convenient for the pay-as-you-enter system, as all the passengers have to pass over the entire platform in order to enter. The practice in Toronto is to leave by the frout door. In order to make this more convenient and comfortable, the general manager, Mr. R. J. Fleming, conceived the idea of dispensing with the front door or bulkhead, leaving almost all the end open. This gives excellent operating results as well as extra capacity both winter and summer. Both seasons are mentioned, as the above description is of a convertible car in its closed form.

Cars Are Convertible Type.

The car interior is finished in quartered white oak relieved by cherry. The trimmings are of bronze. The upholstering is of the



Toronto Railway Company's New Coaches—Convertible for Summer Traffic



Toronto Railway Company's New Coaches—Length Over All 44 Feet 9 Inches

finest red plush. The exterior is of cherry sheeting 1 1-2 inches wide, which can easily be replaced in the event of damage from collisions.

The cross seats used in summer are placed longitudinally for winter use, and covered by a cushion, a leg being required only at the extreme end of each length of cross seat. They are supported in the centre by truss rods underneath the seat. There are very few legs required, thus leaving the space under the seat open, and giving the interior of the car a very sanitary appearance. There is a space left at each door in order to give a clear passage in and out. The seat backs are very light to handle, each side having two sections. They rest on the seats, being securely held by means of clips which they engage. The top of this seat is secured by gate hooks, making the removal of the backs an easy task. For summer use, the side sections of the car are removed, and cross seats placed in position and supported by lugs on the panels and car wall, and held in place by buttons. Wooden backs are dropped into slotted castings making a cool and comfortable seat. The bottom step is attached by means of suitable suspending castings and connected to both platform steps. The second step is contained in the wall of the car, making a support for the sections in winter, and also a guard to prevent the car side from damage by wagons. All the hand-rails remain in position; the removable parts are all secured by bolts which remain in place. The seating capacity of this car in closed form is 38; in open form 70.

Cars are Brilliantly Lighted.

The cars are brilliantly lighted, the bulbs being situated on each side of the roof directly above the seats, giving a very fine illuminating effect, and providing the passengers with plenty of light to read by in any part of the car. By the aid of a special switch, controlling an extra number of bulbs, additional light can be provided during the rush hours, thus giving the conductor an excellent opportunity to collect fares and examine transfers.

Signals Given by Buzzer System.

A very splendid feature about these new cars, is the ''Buzzer System'' for passengers signalling motorman. The electric current operating these buzzers, is supplied from the trolley wire and not from batteries, as heretofore. This system of operaing buzzers is one of the recent developments in the electric field, and no doubt will be taken advantage of by other street railways. The principal reason why electric bells or buzzers have not been used more extensively by street railways, was on account of the batteries being so unreliable. The energy contained in cells would give out unexpectedly and the signal device refuse to respond to contact at the push buttons. Hence the reliable pull bell has always been adhered to in car construction, and the pull bell will continue to be used for conductor's signals and for emergency use, in conjunction with any other system which may be used.

Electrical Equipment of New Coaches.

The new coaches are known as the 1300 class, double truck type. A summary of their electrical equipment follows:

Motors.—Four General Electric No. 80A motors, rated at 40 h.p. each. Two on each truck; single reduction gear drive; open hearth, cut steel, gears and pinions; new type pressed steel gear housings, replacing old type heavy malleable iron cases; motors equipped with ''Le Carbon'' French carbon brushes.

Rheostat.—Toronto Railway standard, removable Grid type.

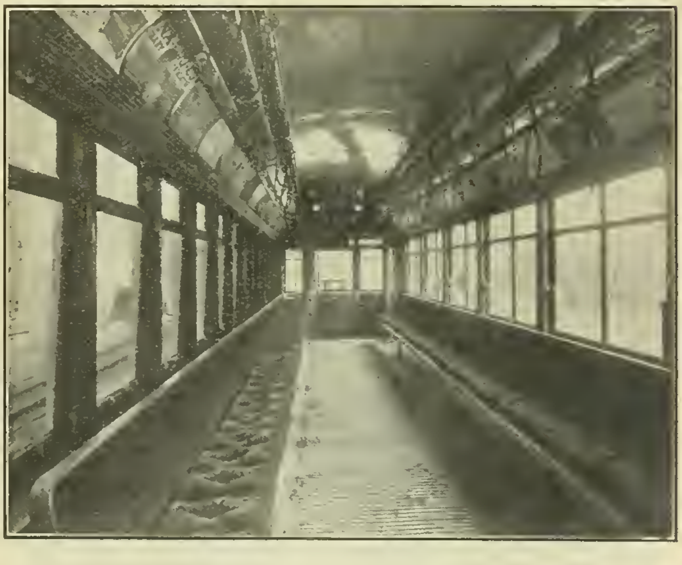
Controllers.—K.6 series parallel controller and M. R. type automatic circuit breaker.

Lightning Arresters.—General Electric standard car lightning arresters.

Trolley Stands.—Standard, Toronto Railway Company roller bearing trolley stands and Shelby seamless steel trolley pole.

Trucks.

The trucks are the Curtis D.2 type of double truck manufactured by the Canada Foundry Company. All steel frames, swinging bolster.



Interior of One of Toronto Railway New Coaches

Axles.—4½-inch open hearth cold rolled steel.

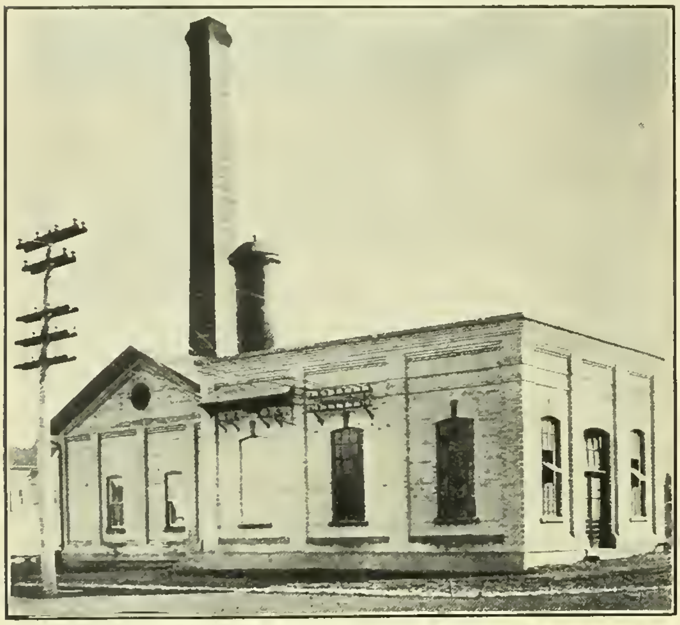
Wheels.—33-inch diameter, 2¼-inch tread, chilled iron.

Brakes.—Equipment consists of Haggen storage air, and National Power brakes, as an auxiliary brake.

Fender.—Watson automatic fenders. These fenders are of the latest improved type and have made an excellent record as life-savers in this city.

Niagara Power now Serves Waterloo

Current Received During November—Will Use 700 H.P. Finally—New Plant Throughout—Electrical Equipment Supplied by Canadian Westinghouse

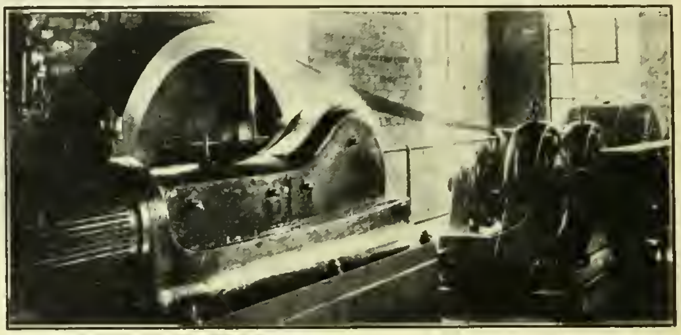


Waterloo's New Distributing Station

During the month of November the town of Waterloo completed arrangements for the utilization of Niagara current. Waterloo is supplied from the Hydro-Electric substation at Berlin, situated about a mile distant. The Berlin substation steps the high tension current from 110,000 volts down to 13,200 volts, at which latter pressure the Waterloo distributing plant receives it.

There are six No. 0 bare aluminum wires (two circuits) strung between the two towns.

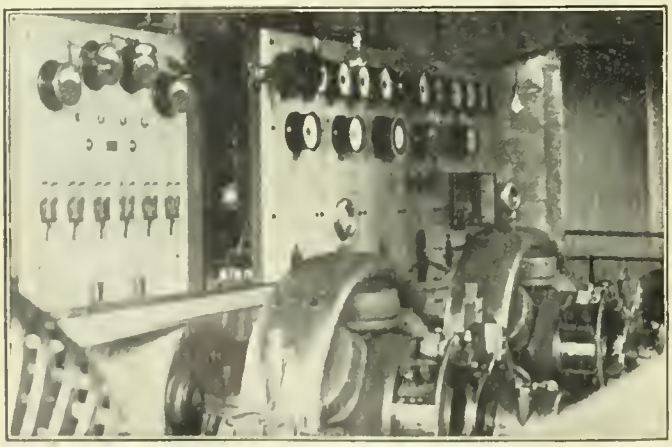
Within the distribution station the current goes through disconnecting switches and choke coils, to the main 13,200 volt remote controlled oil switch, which is mounted in concrete cells. The system is equipped with electrolytic lightning arresters. The transformers, three in number, each of 150 k.v.a. capacity; step the current down to 2,200 volts to the distributing switchboard. The switchboard, which is of blue Vermont marble, is made up of five panels. The first is the incoming line panel, the second is the synchronous motor panel, the third and fourth are power panels, and the fifth is the lighting panel; a street lighting panel is to be added at once. The plant is an entirely new one and has been operated by the Town of Waterloo only since August the first this year. There has been installed a 185 h.p. Robb-Armstrong high-speed engine, connected to a 110 k.v.a. synchronous motor which at present is being run as a generator, also two 40 k.w. d.c. generators. The synchronous motor, which is 3-phase 2,200 volts, will, with Niagara power, be used as a motor. The two direct current machines will be dispensed with as soon as those customers with D.C. motors have them changed over to the new power which will be, at the latest, in the course of about two months.



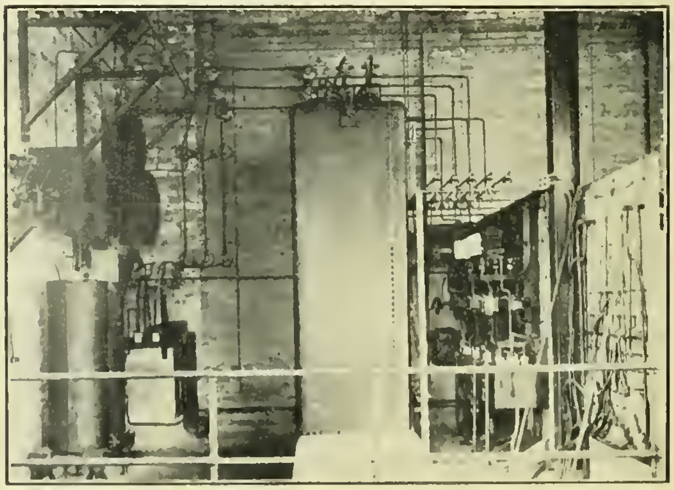
Engine, Synchronous Motor and Two Generators

When the plant is distributing Niagara power the synchronous motor will be used for power factor correction, and in case such power should be shut off at any time the motor will at once be used as a generator driven by the engine stated above. The Waterloo electric building is attached to the waterworks plant, where it is required to have the boilers under steam at all times; so the electric machines may be operated by the auxiliary plant at a minute's notice. The auxiliary plant will likely be used also to keep its eye on the peak load question.

The entire electrical equipment in the Waterloo plant was furnished by the Canadian Westinghouse Company, Hamilton. The plant has been operated at different times during the past few weeks by Hydro-Electric power, and everything has been



Generators and Switchboard, Waterloo

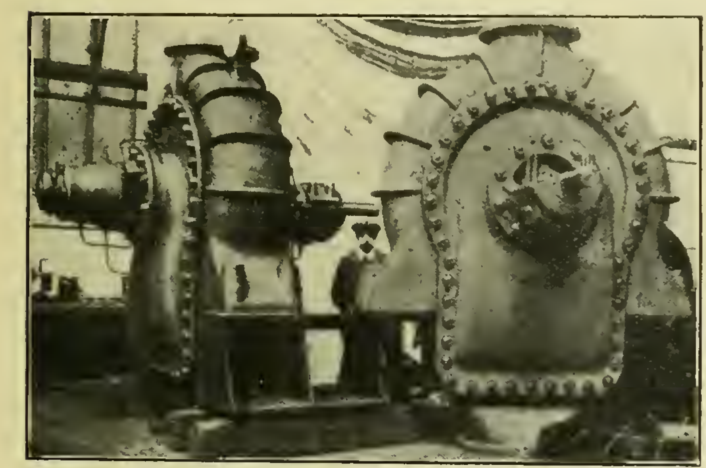


Transformers and Switching Apparatus, Waterloo found to be in a very satisfactory condition. The equipment was installed under the supervision of the town's electrical engineer, Mr. George Grosz, who has justly been highly complimented on the work.

The electric department is managed by a Commission who have endeavored to get the best possible in all cases. The Commission is composed of Mr. Aloyes Bauer, Chairman, Mr. John Ritzer, Mr. J. Chas. Mueller, and Mayor Graybill.

Turbine Pumps for Toronto Water Supply

The accompanying cut shows two of the turbine pumps being supplied to the city of Toronto by the Canadian Boving Company, Ltd. The total number of pumps to be at present installed includes four pumps for the main pumping station, two fire pumps and also two domestic pumps for the high level station on Cottingham street. The four pumps in the main station will be capable of delivering, each, 13 1-2 million gallons per day, against 250 foot head, running at 750 revolutions, normal power 890 h.p., overload 1,500 h.p. The two fire pumps are to deliver each 10 million gallons per day against 110 pounds pressure, at 720 revolutions. The two high level domestic pumps will deliver each 10 million gallons per day against a 65-pound pressure, at 750 revolutions. The pumps, on test, showed an efficiency of 84 per cent.



Turbine Pumps for Toronto—Jens Orten-Boving Type

The pumps are of the high pressure multi-stage type, fitted with impellers and guide wheels of a special bronze, the position of which has been determined by protracted tests and experience in the manufacture of pumps and water turbines. The inner surfaces of the impellers and guide wheel channels are carefully finished throughout, so that the water during its whole passage through the pump, from the first impeller to the delivery casing, never comes in contact with any rough surface. This is an important point, as experience has proved that wheels treated thus have a much longer life when dealing with gritty or muddy water. In addition it is clear that the consequent decrease in friction materially improves the efficiency. The casing is of cylindrical bore. Dismantling and re-assembly of the wheels and diaphragms which fit cylindrically into the casing is an easy matter, as they have only to be pushed in one after the other from the open end. All these parts are interchangeable, the pumps being made to limit gauges throughout. The shaft is made of high grade nickel steel to secure strength and rigidity as well as to resist corrosion. Where it passes through the stuffing boxes, it is covered by renewable bronze bushes, and thus protected from undue wear due to packing material or gritty water. The bearings are of the ring lubricating type, specially designed for high speed and separated by a gap of 2 inches from the packing so that it is impossible for any grit, mud or water to enter.

Personal Mention

Mr. Wills Maclachlan, of Toronto, one of the engineers of the Hydro-Electric Commission, has been appointed superintending electrical engineer of London's three transforming stations.

Mr. K. L. Aitken, chief electrical engineer for Toronto, who has had leave of absence to recover from a nervous breakdown, brought on by overwork on the Hydro-Electric enterprise, is back at his office once more.

Mr. W. G. Ross, late managing director, Montreal Street Railway, was tendered a complimentary banquet on the eve of his departure for the Continent, where, with his family, he will spend the winter.

Mr. Frank G. Scofield, identified with the outlet box business for many years as general manager of the Bossert Electric Construction Company, of Utica, N.Y., has opened an office in the Lumsden Building, Toronto, as direct factory representative for Canada of the Bossert Company, The Enamelled Metals Company, of Pittsburg, manufacturers of "Pittsburg Standard" rigid iron conduit, and the Manhattan Electrical Supply Company, of New York, whose line of electrical specialties is so well and favorably known.

Mr. Francis Dagger, secretary of the Independent Telephone Association, is lending his assistance, as telephone expert, in the preparation of the city's case, by Mr. Drayton, against the Bell Telephone Company, in the latter's effort to increase the general telephone rates in Toronto.

Mr. John W. Dorsey, E.E., has been appointed to the post of lecturer in the Department of Electrical Engineering in the University of Manitoba. He is a graduate of the Baltimore Polytechnic Institute, and later obtained his degree of E.E. in the Department of Electrical Engineering of Lehigh University. Mr. Dorsey is an associate member of the American Institute of Electrical Engineers and a member of the Society for the Promotion of Engineering Education. The appointment is looked upon as a valuable addition to the staff of the University.

Mr. W. H. Reynolds, well and favorably known in the electrical contracting field, who until recently has been connected with the sales department of the Eugene F. Phillips Electrical Works, Limited, Montreal, has been promoted to be western manager, with headquarters at Winnipeg, to replace George A. Powell, formerly western agent of the same firm.

Mr. W. H. Reynolds

Electrical Development in British Columbia

B. C. E. R. Making Big Extensions—Power Developments Nearing Completion —Telephone Company Spend Half a Million—C. P. R. Laying 10 Strand Cable

Power Plants

Messrs. Mackenzie & Mann and associates, of the Canadian Northern Railway Company, who recently acquired the Dunsmuir coal interests on Vancouver Island for $11,000,000, have already initiated a great scheme of development under the title, The Canadian Collieries Limited. It has been decided to create 50,000 electrical horse power by utilizing the falls on the Puntledge river, in the centre of the Comox coal field, at a cost of about one million dollars. Engineers are now at work, and in the course of a couple of weeks hundreds of men will be employed in building a huge dam across the river and erecting the necessary power plant. The entire undertaking will extend over a year. The electrical energy to be developed there will be utilized in operating a system of compressed air haulage in the mines and in running the various plants as well as the 14-mile railway connecting the various collieries with the ore bunkers at Union Bay. Mr. A. D. McRae, general manager of the Canadian Western Lumber Company, Limited, of Fraser Mills, B.C., who is in close touch with Messrs. Mackenzie & Mann, is also general manager of the Canadian Collieries Limited.

Good progress is being made in connection with the scheme of electrical power development required to carry out the aims of Powell River Paper Company, in which Mr. M. J. Scanlon, of the Brooks-Scanlon Lumber Company, and other well known United States capitalists, are interested. Construction work on the immense pulp mill, saw mill, company buildings, wharves, etc., at Powell River, 75 miles up coast, is well advanced, and a start has been made on the huge dam to be thrown across the falls a mile and a half inland, intended to make a storage reservoir of Powell lake, which extends inland for 40 miles. The company is providing for ultimate requirements of 45,000 h.p., but penstocks to handle only 26,000 h.p. are being installed for the present. The total investment will reach $2,000,000, and the annual pay roll of the concern is placed at $500,000.

Nearly 900 men are engaged on the various works connected with the big power development undertaking of the British Columbia Electric Railway Company at Jordan river, Vancouver Island, and splendid progress is being made. The power house is well advanced, the construction of the dams has been commenced, the pipe-line route from the forebay reservoir to the power house has been cleared and trenched, and pipe laying begun, and rapid progress is being made on the six and one-half mile wooden flume. By the time the costly machinery arrives on the ground the buildings and necessary works will have been completed, and it is expected that the plant will be ready to furnish power in the early spring. The undertaking has proved one of great difficulty owing to the exceedingly rough and broken topographical features of the country where the site for the power house has been chosen. Many thousands of dollars had to be expended in land-clearing preparatory to the actual work on the installation of the power house and system. The monthly pay-roll reaches the large sum of $70,000.

The International Electrical Company, Ltd., comprising Nelson, Spokane and Portland capitalists, which was organized to develop the vast water powers of the Pend d'Oreille river, has received a preliminary report from Mr. W. E. Moore, the hydraulic engineering expert sent over the route. The river runs to the United States some fifty miles southwest of Creston, B.C., and for nine miles before reaching the boundary it is a series of rapids capable of developing enormous quantities of power. At a point on the Canadian side some six miles from the border the company propose to establish their initial plant, the horsepower available being estimated at 65,000. The cost per horsepower of development is placed at $60, which is considered to be a very low figure. The Sheep Creek and Ymir mining districts are within fifteen miles of the proposed power sites, and Spokane is a possible customer for power, being only 100 miles distant.

Electric Railways

The opening of the British Columbia Electric Railway Company's suburban line between New Westminster and Chilliwack, a distance of 63.8 miles, marks a new forward movement on the part of a company which is doing much for the development of the coast. The official opening was attended by a number of leading citizens of Vancouver and Victoria, as well as by the councils of the various municipalities interested, who were guests of the company. The last spike was driven by Premier McBride in the presence of a large gathering. Various speakers dwelt upon the importance of the new link in the network of transportation which will make it possible for the farmers and dairymen of the district served to keep in close touch with the markets at New Westminster and Vancouver. The B.C.E.R. now has 200 miles of track on the mainland and 25 miles in Victoria. Other sections of the fertile Fraser valley will in the near future be served by lines to be operated by the Western Canada Power Company, whose great power development plant at Stave lake is approaching completion. These lines will promote settlement and enhance to a wonderful degree the prosperity of Vancouver and New Westminster, as well as the small towns throughout the district served.

The British Columbia Electric Railway Company is completing plans for a substantial addition to its lines on Vancouver Island by opening up the Saanich peninsula, which is tributary to Victoria. The new power plant at Jordan River makes this enterprise possible. As the line will pass through a very rich farming and fruit district it is expected that it will bring about a wonderful development of new resources. Other suburban extensions of the city lines are under consideration.

Point Grey, which promises to become Vancouver's most aristocratic suburb, will soon be grid-ironed with electric lines. The municipality has entered into an agreement with the B.C.E.R. to build lines on a number of leading streets, and work is to be pushed with all possible despatch. The routes planned and approved are as follows: On Granville street, from 16th to 24th avenue; on Oak street, from 16th to 24th avenue; on Oak street, from Essex street to River road and along River road to 4th street; on Alma street along 10th avenue, Sasamat street, 4th avenue to Dufferin street, on Alma street, from 10th avenue to 16th avenue; along Clerc and Wilson roads to the Lulu Island Railway track at Kerrisdale station.

It is probable that the next important suburban extension undertaken by the B.C.E.R. Company will be a line along the south arm of the Fraser to Ladner municipality. Engineers are making the necessary surveys.

The grading of the new British Columbia Electric Railway tram line to Sapperton, a suburb of New Westminster, via Burnaby, known also as the Vancouver, Fraser Valley & Southern Railway, is now approaching completion. Rail laying has already been commenced, and will be rushed by a small army of workmen. Unforeseen difficulties were encountered in the shape of numerous sinkholes, some of which appeared to be almost bottomless. Thousands of yards of material sank out of sight, and in places piles had to be driven to a depth of 60 feet.

Lady patrons of the British Columbia Electric Railway are blessing the management for having at last yielded to their prayers to substitute easier and better steps for those at present in use on the street cars. There will be three steps instead of two, as at present, and the first will be quite close to the ground. Passengers on the pay-as-you-enter cars will also be permitted to leave by the front door if they so desire. This will encourage passengers to obey the conductor's call to "move up."

A project is under way to construct an electric railroad from Barkerville down the Willow river to join the Grand Trunk Pacific Railway at or near Fort George, a distance of about 120 miles. The enterprise is being undertaken by the Barkerville-Willow River Company, with headquarters in Vancouver. The proposed road will bring the Cariboo mining district into direct railway communication with the outside, and dispense with the heavy freight charges for the transportation of supplies over the 300 miles of rough road from Ashcroft, on the C.P.R.

Nelson's rejuvenated street car system was given an initial tryout November 9th. The rolling stock at present comprises only two cars, each operated by four 40-h.p. motors, but additions will be made to the number in the near future. During the trial run trouble was experienced when ascending grades owing to the fact that the rails were covered with oil and grease from lying idle so long.

Telephone and Telegraph

Material orders meaning an expenditure of over $500,000 and calling for half the output of the Wire & Cable Company, of Montreal, for the next six months, as well as a large proportion of that of the Northern Electric Company of the same city, have just been sent east by the British Columbia Telephone Company.

Not only do these huge orders mean the expenditure of a vast amount of money, but they also mark the culmination of seven months spent by the telephone company employees in plotting out every house and lot in the Greater Vancouver peninsula which might mean a telephone possibility. In order that the preparations of the company for increased plant and equipment might prove to be adequate to the needs of the district it was designed that a complete plan should be prepared of every lot and building in this section of the country where telephones would sometime in the near future be required. Such a plan as this naturally meant a great amount of labor. Not only were the buildings now occupied and those under construction taken into consideration, but even the empty lots where it was thought that houses would soon make their appearance if the district's rate of growth continued were added to the scheme. This involved over half-a-year's work and meant that while it was going on comparatively little could be done in the way of securing cable and other wire supplies for the reason that it might be found on the completion of the development study that the cables or other facilities would not fit in with the other portions of the system.

The plotting labor was finished just a short time ago and since then the orders have been simply pouring into the offices of the two Montreal firms from the British Columbia Telephone Company. So great was the demand on the Wire & Cable Company that the orders of the Vancouver concern meant more than half the output of the Wire & Cable Company for the next six months. Over 250,000 feet of cable are required for the purposes of the telephone company, averaging in size 200 pairs of wires per cable. Some of the cables, however, will go as high in capacity as 600 pairs of wires. The total capacity of the cables ordered from the Wire & Cable Company is 100,000,000 feet of copper telephone wire.

In addition to these large orders 25 tons of supporting wire for the cables is on the way from Montreal, while 60 tons has already arrived from England and a similar shipment is still to come. It was found necessary to go to the old country for a portion of the supporting wire as the Montreal firm was not able to handle the whole order in connection with the cables and the other wire.

The capacity of the Northern Electric Company is also being severely taxed by the demands of the British Columbia Telephone Company. As many as 52 switchboard sections have been asked for Vancouver and North Vancouver, being more than the firm is at present making for the whole of the rest of Canada. Over 3,000 telephone instruments are also to come from the same company.

In connection with the new offices being erected in Kitsalano, Mount Pleasant and Grandview, the Northern Electric Company is sub-letting contracts for three heavy duty White & Middleton gas engines for emergency use in case the regular power goes off. The ordinary power will be supplied to the branch exchanges by three 24-volt generators to which will be attached thirty 40 h.p. induction motors.

The material now on order for the telephone company is arriving at the rate of a carload one day in each week and in order to properly handle the supplies at this end a private railway yard has been established on Dunlevy street in close proximity to the C.P.R. line, where the material will be received and stored.

The material value of the orders mentioned above is given out as something over $350,000. When the freight, installation, labor and cost of the branch exchange construction is taken into account it is expected that the total outlay necessitated by the improvements contemplated will be well over the half-million mark.

Good progress is being made on the erection of the branch exchange. In addition to these buildings the local business of the company will be further handled in a new portion added to the present Seymour street main office. There, a three-storey brick addition has just been completed. The first two floors are to be devoted to plant department offices, while the top storey will be occupied by the long distance toll switchboard, which is to be moved out of the general switchboard room to provide space for the new local switchboards to be installed.

A new cable for the C.P.R. telegraphs was recently laid across the upper Arrow Lake below Arrowhead. The old cable, containing two strands, went out of business last spring during high water, and the company rushed pole line around the head of the lake, 28 miles, on which a single wire has had to take care of the business while the new cable was being made. It contains ten strands—a good indication of the growth of business looked for by the company.

The British Columbia Telephone Company will next spring lay a second submarine cable between Victoria and Vancouver. The new cable will be similar to the one laid between France and England, known as the Pupin coil cable, having special fittings for taking up the aquatic electrical currents.

The triangle wireless station of the Dominion Government, near Prince Rupert, reports having been in communication recently with the wireless station at Honolulu, a distance of 2,600 miles. Several messages were exchanged.

Miscellaneous

In conformity with the report of its consulting engineer, Mr. J. R. Freeman, the Dominion Government has authorized the Vancouver Power Company to proceed with the construction of the 85-foot dam at Coquitlam Lake, against the erection of which a protest was lodged by the Council of New Westminster on the ground that the city's water supply would be endangered.

It is probable that current for the lighting of the new Cambie street bridge across False Creek will be supplied from a small electric plant to be operated in connection with the city's new incinerator, located near the easterly end of the structure.

Rapid progress is being made with the preparatory surveys connected with the project of The Canadian Collieries for the development of 50,000 electrical horsepower on the Puntridge river, in the centre of the Comox coal fields, Vancouver Island, recently acquired by Messrs. Mackenzie & Mann and associates. The power plant will cost about $1,000,000. As soon as the engineers complete their plans some hundreds of workmen will be employed.

P. D. Peterson, of Eau Claire, Wisconsin; R. Zerbel, of Humbird, Wisconsin, and R. H. Schulz, of Madison, Wisconsin, recently paid a visit of inspection to the plant of the Bull River Power Company at Bull River Falls, halfway between Wardener and Fernie, B.C. These gentlemen, who are financially interested in the plant, expressed their satisfaction with the progress of the work under Manager George Henderson's guidance.

Mr. Wynne Meredith, the well-known San Francisco electrical engineer and consulting expert, who is overseeing the Jordan River plant of the B.C. E.R., spent a day in Vancouver recently on his way back from a hunting trip up the coast. He was accompanied by Mrs. Meredith, who proved herself a splendid markswoman.

The new passenger station to be erected for the B.C. E.R. at New Westminster will cost in the neighborhood of $100,000. Work upon it will be commenced shortly.

Under an agreement entered into by the city of Victoria and the British Columbia Electric Railway Company, the latter undertook to supply power to the city at one-half what it is now costing the city, as soon as the company's Jordan River power plant was completed. As this will be in operation by early spring, the city has already submitted figures showing the present cost, but it is understood that the company contends that certain administration charges should be included in the city's figures, and it is likely that considerable discussion will ensue before a final figure of cost is arrived at.

Messrs. Parr & Fee, who have the contract for installing the new ornamental light standards on Granville street, have most of the standards in place and wired, and part of the system is in operation. Messrs. E. A. Earle & Son, who have Hastings and Georgia streets and Westminster avenue systems in charge, have over 80 per cent. of the property-owners signed up, and hope to have the lights turned on before Christmas. The agreement between the British Columbia Electric Railway Company and the city provides that the current necessary to operate the lights will be supplied until February 12, 1919, at the rate of two cents per kilowatt hour according to the registering of the company's meters. Citizens are eagerly looking forward to the installation of the system, it being felt that the present plan of arc lighting is too antiquated for a city of Vancouver's pretensions and appearance.

Mr. James Ross, the well-known Montreal capitalist, visited the coast last month. While in Vancouver he inspected the plant of the Western Canada Power Company at Stave Falls, being a heavy shareholder in the company.

Trade Publications

Watt-hour Meters.—A very instructive pamphlet on the principles of construction and operation of watt-hour meters has just been issued by the Westinghouse Electric & Manufacturing Company. Though in the form of a descriptive circular, the pamphlet goes at some length into the question of rates and the theory of meters, and points out the importance of the various features and adjustments of modern meters, both a.c. and d.c.

Christmas Shopping.—A little booklet on electrical appliances suitable for Christmas gifts, which is being distributed by the Toronto Electric Light Company.

Quality Apparatus.—Pamphlets Nos. 32 and 32, by Stromberg-Carlson Telephone Manufacturing Company, describing a flat type metal bell box with a portable desk telephone and a 30-lamp line capacity, private branch exchange, switchboard.

The Insulator Book.—Issued by the Locke Insulator Manufacturing Company, Victor, N.Y. A complete catalogue of the insulator products of this company, well illustrated.

The Factory Behind the Phone.—Booklet describing the factory of the Kellogg Switchboard & Supply Company, Chicago. Being distributed, on request, to interested telephone men.

Verity's, Limited.—Of 28 King street, Covent Garden, W.C. Publication No. 616, on the subject of crystal glass fittings, also short publications concerning the field of household appliances, electric signs, auto-transformers, arc lamps.

Electrical Laboratory Apparatus.—Catalogue issued by the Thordarson Electric Manufacturing Company, Chicago, dealing with various types of apparatus designed for demonstration purposes in an electrical laboratory. The apparatus includes induction motors, spark coils, resonators, condensers, spark gaps, transformers, current regulators, rotary converters, etc., etc. Excellent diagrams illustrate a number of polyphase current connections.

Electric Hoisting Specialties.—Catalogue by the Witton Kramer Company, of Birmingham, descriptive of their various types of electric hoists, travelling on monorail. Either hand push type or electrically remote controlled. The catalogue includes also electric cranes, winches and lifting magnets.

Dossert & Company, New York, have just issued an eight-page folder which illustrates and describes a number of new Dossert specialties, particularly a new anchor connector for use with strain insulators and a new insulated cover for cable taps.

Manitoba Bridge & Iron Works, Winnipeg. Grain elevator, conveying and power transmission machinery catalogue. Price list appended.

Short-title Catalogue of Publications and Importations of Scientific and Engineering Books by D. Van Nostrand Company, New York.

National Electric Lamp Association publications. Bulletins Nos. 13 and 14 have titles as follows—"Madzd-Multiple Lamps" and "Hylo-Economical Turn-Down Electric Lamps."

"Electra" Carbons—Short bulletin distributed by the Canadian General Electric Company. Also "Condulet Talks" Nos. 124 and 125.

Water Power—Catalogue D, issued by James Gordon & Company, London, Eng., describing their Samson upright and Francis turbines, Pelton wheels, governors, pipe lines and pumps.

The Packard Electric Co., St. Catharines, have recently issued separate bulletins covering the following—Price list of incandescent electric lamps; Jandus interchangeable arc lamps; Jandus alternating arc lighting system; large transformers for electric smelting; Packard Type "C" high efficiency transformers, for lighting and power; induction motors.

Canadian General Electric—Condulet Talk, Nos. 127 and 128. Letter No. 177 concerning "Miniature Sockets and Receptacles." Short bulletin on switch durability.

Fullman Floor Outlets.—Booklet isued by the Steel City Electric Company, Pittsburg, descriptive of the Fullman adjustable watertight floor outlets.

The Maritime Provinces Making Progress

The Dominion Exhibition at St. John—Most Complete Ever Attempted in the East—A Neat Nova Scotia Power Plant—First Exhaust Turbine in Canada

The Dominion Exhibition, recently held in St. John, New Brunswick, was opened by His Honor Lt.-Gov. Tweedie. Many of the prominent business houses in the Maritime Provinces and a large number of Ontario and Quebec Province firms had exhibits and representatives on the grounds.

St. John Railway Company's Exhibit.

The St. John Railway Company and the New Brunswick Telephone Company were the only two exclusively electrical displays on exhibition. The St. John Railway occupied four booths. In the first booth they showed the latest designs of fixtures in shower effects and a number of different styles and colors in Tiffany shades; in the centre of the booth an art glass dome was installed. These, together with the different styles of brackets, made a pleasing effect and were much admired.

The second booth was devoted to Sunbeam Mazda lamps, holophane reflectors and different styles of tungstoliers. The illumination in this booth was designed to show the advantages of the combination of tungstoliers, holophone reflectors and Sunbeam Madza lamps for commercial lighting. The Sunbeam Incandescent Lamp Company was represented by Mr. T. R. Price, well known throughout the Maritime Provinces. Mr. F. R. Pendleton was present looking after the interests of the Holophane Company and B. H. Schurr represented the Tungstolier Company.

Shower Effects—Dominion Exhibition at St. John

The third booth contained an exhibit of heating goods, consisting of irons, toasters and other lines of these grades carried in stock by the St. John Railway Company. In this booth the company installed samples of their stock of art glass domes, consisting of fifteen different designs. A washing machine and wringing machine, with motor attached, and in operation, attracted considerable interest.

In the fourth booth the company had an exhibit of a complete line of wiring supplies.

The whole exhibit attracted many interested people and was favorably commented upon by visiting electrical men. It is the largest and most complete exhibit ever attempted in the Maritime Provinces and the St. John Railway Company are to be congratulated on its success.

The N. B. Telephone Co. Exhibit.

The telephone company erected an exchange on the grounds, connecting up most of the exhibits and giving connection with the city and long distance connection all over the Maritime Provinces, a convenience much appreciated by the visitors. In addition this company gave their patrons free telephone connection all over their lines in New Brunswick during the hours between 12 and 2 o'clock every day.

Holophane Reflectors and Tungstoliers

Other Exhibits.

The Canadian Fairbanks had, in addition to their regular line of stationary gas engines, pumps and woodworking machinery, a line of transformers and century motors. Also a large line of electric ignition supplies was of great interest to electrical men. The exhibit was in charge of D. C. Ryder, the manager of the St. John branch.

Heating Appliances and Art Glass Domes

J. A. Pugsley exhibited Russell, Reo and Ford automobiles; P. & R. storage batteries; Sampson spark coils; Spitfire, Rajah and Taxi spark plugs, and a complete line of ignition supplies. This exhibit was in the Transportation Building and attracted a good share of attention.

The Street Illumination.

During exhibition week the city of St. John contracted with the St. John Railway Company for a street illumination, consisting of a line of lights on each side of the street the whole distance from the Intercolonial Railway Station to the Exhibition Grounds. The installation called for 1,368 100-watt tungsten lamps, 684 on each side of the street, ten feet apart. The visitors to the city christened this the "Great White Way."

Wiring Supplies—Dominion Exhibit, St. John, N.B.

This is the largest street illumination ever attempted in the Maritime Provinces.

In addition to the above, the St. John Railway Company furnished the installation and current, gratis, for the decorations on King square. This consisted of 400 colored lights distributed throughout the square. The illumination was very effective.

First Exhaust Turbine in Canada

The erection of a new exhaust steam turbine engine at No. 2 Colliery of the Dominion Coal Company's work at Glace Bay, is practically completed, and within a few days, just as soon as some necessary changes are made in their power plant by the company, the new engine will be turned over to the company by the manufacturers, Daniel Adamson & Company, of Dukinfield, near Manchester, England.

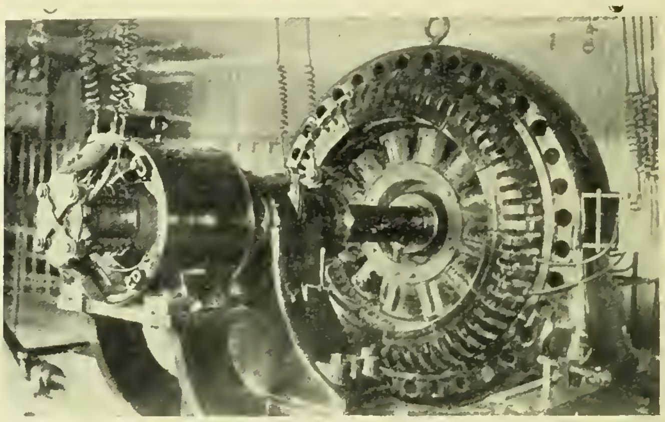
The new engine will furnish power for all the company's plants to the extent of 1,400 horsepower from what has heretofore been waste steam from the other engines about the colliery. This engine is the only exhaust steam turbine installed in Canada, the Dominion Coal Company being the first to instal such an engine, that means a big saving in steam power. The manufacturers are represented by Mr. Roderick J. McLeau, an expert on turbine work.

The Nova Scotia Steel & Coal Company are following in the wake of the Dominion Coal Company, and will instal two 680 horsepower low pressure turbines at their works in New Glasgow, generating electricity for their plant, by using exhaust steam from their rolling mills.

Mr. McLean states that two more 3,000 horsepower mixed pressure turbines will be installed very shortly. The engines have been built and will be shipped within a few weeks. These engines are to be for "blowing" purposes in connection with the blast furnace work, and will be the largest in the world of their kind.

Liverpool, N. S. Uses 21 Foot Waterfall

A neat, little Nova Scotia plant is illustrated below which shows one of the 225 kilowatt Bullock generators of the town of Liverpool. The motive power is a waterfall of 21 foot head, on the Mersey river, a few miles from the town, controlled by two wing dams, 1,800 feet and 800 feet in length respectively. The two turbines are Crocker type, horizontal shaft, 40-inch wheel, manufactured by the Jenckes Machine Company, of Sherbrooke. Their speed is 150 r.p.m., and guaranteed capacity 375 k.w., each under a 22-foot effective head. The generators, of which there are two, are Bullock manufacture, belt driven, 225 k.w. capacity, 2,400 volts, 2-phase, 600 r.p.m. The exciters are also shown in the figure, operated on one end of the generator shaft. A transmission line, 5½ miles in length, carries the current at 2,400-volt pressure into the town for light and power purposes. The plant is operated under the able management of Mr. A. H. Drew. The town lighting consists of some thirty incandescent street arcs, and about 2,500 incandescents are installed for indoor lighting.



225 k. w. Bullock Generator, Liverpool, Nova Scotia

Dominion Jurisdiction Upheld

The Department of Justice at Ottawa has been notified that the appeal of the Burrard Power Company, of British Columbia, which affects the question of provincial and dominion jurisdiction over water rights in the railway belt of British Columbia has been dismissed by the Privy Council. The Burrard Power Company has been supported throughout in these proceedings by the British Columbia government, which had given a grant of water records in the Lillooet river to the company. The grant was opposed by residents in the district and the Dominion government stepped in, claiming jurisdiction over water rights within the railway belt. The decision of the lower courts was in favor of the contention of the Dominion government and from this judgment the Burrard Power Company appealed to the Privy Council, with the result that the decision of the lower courts in favor of the Dominion government's jurisdiction has been upheld. Mr. F. C. Wade, K.C., represented the Dominion government in the proceedings here and before the Privy Council.

Brush Establishes Canadian Office

The Brush Electrical Engineering Company, Limited, of London and Loughborough, one of the leading engineering concerns in England, has established a branch through the Canada Ford Company, Canadian Express Building, Montreal, which will handle all their well-known manufactures, including steam turbines, high speed engines, electric generators, motors, transformers, electric lamps, fans and other apparatus, steam and electric locomotive, and street car and underground rolling stock.

T. J. Phelan, superintendent of Dominion Government telegraphs in British Columbia and the Yukon, is overseeing the construction of 160 miles of line between Stewart and Kitsumalkum, which will connect with tho present system at Hazelton.

The Independent Telephone Convention

Fifth annual Convention of the Canadian Independent Telephone Association—Important resolutions passed—President and Secretary review the year's progress

The Canadian Independent Telephone Association held its fifth annual convention in Toronto on Nov. 17. For a young organization this Association is becoming exceedingly vigorous, the recent convention far exceeding previous years, both in numbers and interest. The most important matter under discussion in the Independent Association is probably that asking the Government to compel the Bell Company to provide connection with other local companies. This matter was covered in one of the resolutions.

A decidedly important step in the organization of this association has been the appointment of a permanent secretary who is enabled to devote practically his whole time to the interests of independent companies in Canada. In Mr. Francis Dagger the association was fortunate in securing a man not only thoroughly versed in telephone matters, but also keenly alive to the interests of independent telephone users. To this wise choice the association doubtless owes much of the past year's successful progress.

The Resolutions.

Four important resolutions were passed by the members in convention as follows:

"That the following shall be eligible for membership of the association: All proprietors, stockholders and officers of telephone systems in the Dominion other than those owned by the Bell Telephone Company of Canada, or in which that company has a controlling stock interest.

"That representations be made to the Ontario Government to repeal the present law giving municipalities the power to grant exclusive telephone franchises.

"That it is desirable to amend the Local Municipal Telephone Act by making provision for the appointment of a board of commissioners by the ratepayers who pay the cost of construction, in each case, to undertake the management of any system constructed under this act.

"That representations be made to the Dominion Government as to the desirability of amending the Railway Act, empowering the Board of Railway Commissioners for Canada to order connection between rural telephone systems and the local systems of all companies within the jurisdiction of the Parliament of Canada."

Officers for the Coming Year.

Dr. Doan, president for the past year, was again re-elected to the same office. The full list of officers for the ensuing year is as follows: President, W. Doan, M.D., Harrietsville (re-elected); Vice-President, C. Skinner, Sherbrooke; Secretary-Treasurer, Francis Dagger, Toronto (re-elected); Executive Committee—P. R. Craven, New Liskeard; T. R. Mayberry, M.P.P., Ingersoll; A. Hoover, Green River; Levi Moyer, Beamsville; M. House, Bridgeburg; T. R. Ralph, North Augusta; G. W. Jones, Clarke, Ont.; T. G. Ramshaw, Lowville; George Taylor, Blenheim; Auditors—C. B. Adams, Harrietsville, and A. Denholm, Blenheim.

The Secretary's Report.

In his report as secretary, Mr. Francis Dagger stated that four years ago there were in the whole Dominion 73 companies, having 12,073 subscribers, representing a capital investment of $850,000. Within the past few weeks he had received certified reports from 132 systems in Ontario alone, furnishing service to 10,680 local and 18,000 rural subscribers, representing a capital investment of $1,000,000.

"As there are more than 400 systems in this province, furnishing service to more than 50,000 subscribers, it is," said Mr. Dagger, "no exaggeration to state that this represents a capital investment of not less than $2,500,000."

The following general review was also presented by the secretary:

"Five years ago the Canadian Independent Telephone Association was organized among other objects, 'for the purpose of bringing into more general use, improving and cheapening telephone service in Canada.' Looking backward and surveying the field, who will have the temerity to suggest that the Association has not fulfilled the purpose of its organization and lived up to its constitution in this respect. Five years is a very short space in the life of the average man, and when I remind you that in this short period more independent telephones have been installed in the Dominion than were placed in service by the Bell Telephone Company of Canada during the preceding 25 years, you will agree with me that this is no idle boast.

Mr. Francis Dagger

And when I again remind you that this work has been accomplished in the face of much opposition and discouragement on the part of those who desired a monopoly of the business and by men who had to buy their experience, sometimes at great cost, you will further admit that we have every reason to be proud of the result.

"Five years ago the Bell Telephone Company was looked upon as the one and only telephone system which counted for anything in this Dominion, British Columbia alone being excepted. To-day we find that the operations of this corporation are confined to two only, of the nine provinces of Canada. Nowhere else than in Ontario do we find the sign of the Blue Bell, for even in the Maritime Provinces, this modest flower is no longer in evidence to remind the people that the telephone is a natural monopoly, subject only to the rule of the magnates of New York and Boston. To what may we ascribe this wonderful change in the telephone conditions of the Dominion, and this limitation of what was once an uncontrolled monopoly,

Canadian Independent Telephone Convention—Executive Committee with a few of the Delegates

if not to an awakened public opinion as the result of the unremitting efforts of those who have been connected with this Association since its inception. It is extremely doubtful if the western provinces would now be enjoying the benefits of a publicly owned telephone service, had it not been for the pioneer work of the independent telephone movement in the face of the keenest Bell opposition for it is an undisputed fact that this movement paved the way for public ownership, and rendered easy the task of politicians who were progressive enough to adopt it as a plank in their platform. I refer to these facts by way of introduction lest we should forget and minimize the importance of what has been accomplished, and by way of caution not to underestimate the possibilities of the future, so that we may take courage and continue the good work with renewed energy and confidence.

"As your secretary for the past year I have to report that much work has been accomplished, and I have no hesitation in saying that as a result of this Association in 1910 the many and varied interests of the hundreds of local and rural telephone systems in this province, whether members of this Association or not, stand to-day upon a firmer and more secure basis than ever before.

"When we met last year we were forced to admit that the question of 'Bell' connection under the then existing contracts was a serious menace not only to the owners of local and rural telephone systems, but also to the interests of the public who desire to have full value of an unlimited service. As a result of this Association's representations the Ontario Government last session passed legislation, which makes it no longer possible, in this province at least, for the Bell Telephone Company to say to those companies which find it necessary to connect with its system, 'you shall not do business with your neighbor without our consent,' for under the Ontario Telephone Act you are free to interchange service with whom you will. Nay, more, you can compel your neighbor to give your subscribers the benefit of his service upon fair and equitable terms. The effect of this legislation is that it will henceforth be impossible for the Bell Telephone Company to so arrange its contracts that the security of your investment will depend upon your obedience to its dictation. I know of one company which but for the existence of this Act would have been cut off from another system having over 700 subscribers, at the dictation of the Bell Telephone Company. In another case two independent companies each operating over 400 telephones, which had unfortunately fallen out and established separate switchboards in the same town, by the intervention of the Ontario Railway and Municipal Board, which administers this Act, were brought together again, an amicable agreement arranged, and the two systems are now operating from the one central office. In other cases interchange of service has been arranged, which would not have been possible but for this recent Act. The Ontario Railway and Municipal Board has entered fully into the spirit of this legislation and taken up the duties of its administration with a zeal for the public good. You have now the satisfaction of knowing that there is a fair and impartial tribunal to which all misunderstandings and disagreements in regard to interchange of service can be taken and a square deal obtained unfettered and untrammelled by the selfish interests of the Bell Telephone Company. I need scarcely tell you that this legislation was not obtained without much anxious thought and vigilance on the part of those who prepared the Act and watched it through the Legislature. Too much praise cannot be given to Mr. Charters, who introduced the bill, to the Hon. I. B. Lucas, and the other members of the Telephone Committee, who loyally resented the efforts of Bell representatives to so change the phraseology as to render its purpose abortive. The reception with which this bill was met inside the House furnishes a proof that Ontario, at least, has a Legislature which is impregnable to corporation influence when the greatest good to the greatest number is involved. Moreover, the introduction of this legislation created an interest in telephone matters which has brought about a better understanding as to the importance of the work which you have been doing during the past five years. I do not believe that there was one provincial member who had the remotest idea of the number of Ontario systems or of the large investments in local and rural systems outside of the Bell Telephone Company. The Ontario Railway and Municipal Board is at present gathering reliable data in regard to all Ontario independent systems, and I venture to predict that when the Government is placed in possession of all the facts in regard to the business which you have established, it will stand ready to assist you in every reasonable way to develop and extend that business, and protect your investment.

"Another matter to which much time has been devoted during the past year is that of interchange of service with the 'Bell' long distance lines. This question comes under the jurisdiction of the Board of Railway Commissioners for Canada, which has power to order this interchange of service on terms which it may decide. It is well known that few systems, unless they are owned or controlled by the Bell employees, are interchanging service under contracts which are satisfactory to the proprietors. It is true that the terms are presumably agreed to, but it is a question of 'Hobson's choice,' or in other words the Bell says, 'Accept the terms or go without connection with the town in which a good natured council has given us the exclusive right to do business.' To give only one illustration of the unfair nature of these contracts ,within forty miles of Toronto there is a company operating its own exchange with over 150 subscribers. In order to obtain 'Bell' connection it has built sixteen miles of metallic trunk line, the 'Bell' Company's only investment being a mile and a third of line on its existing town poles. As a result of this contract the 'Bell' gets a revenue of $1,100 a year and the independent receives for its share of long distance tolls over the lines which it has built only $190 a year, or a difference of $910 in favor of the 'Bell.' And yet the 'Bell' local subscribers have unlimited free service with the 150 or more subscribers, over the trunk lines which this independent company had to build under its contract. And yet I wonder how many independent companies who have signed these contracts have taken the trouble to figure out how much they are getting from and what they are giving for the 'Bell' connection? Remember, if you are not paying this money to the 'Bell' your subscribers are, and it is your duty, and the duty of this Association to protect the public against excessive charges. Even if the charges are not excessive you owe it to your shareholders to get as much as you give, all other things being equal.

Counsel has been Engaged

"An application has been made to the Dominion Board by a number of companies with a view to finally settling the terms upon which interchange of service with the 'Bell' long distance lines may be made, and the case will be heard shortly. Mr. H. D. Gamble, K.C., has been engaged as counsel to prepare the application and present it to the Board, and it is believed that the decision will enable those companies desiring 'Bell' connection to secure it on better terms than hitherto.

"In the preparation of this case it has been discovered that the Board of Railway Commissioners has no power to order an interchange of service between a rural system and the local subscribers of a 'Bell' system. This is a very important matter in view of the existing exclusive franchises enjoyed by the Bell Telephone Company in some cities and towns. It is recommended that steps be taken to secure an amendment to the Railway Act covering this omission.

"Dealing with exclusive franchises, this is a matter which requires serious consideration and immediate action. The granting of these franchises not only enables a very few men to impose a monopoly on all the people, and tie the hands of successive councils for five years, but it places the rural telephone users entirely at the mercy of the Bell Telephone Company by enabling it to dictate its own terms of entrance inside the town limits.

"At the present time there is an Act which provides that all agreements between municipalities and corporations which have been declared to be for the general advantage of Canada (which includes the Bell Telephone Company), must be approved by the Lieutenant-Governor in Council. Shortly after the Act passed the Bell Telephone Company submitted one of these agreements to the Lieutenant-Governor in Council and obtained an order approving it. Since that time a number of exclusive franchises have been obtained, the Bell Telephone Company, using the same form of agreement to which this Order-in-Council has in each case been accepted as the necessary approval under the Act referred to. It would appear that the time has come when the Ontario Government should be appealed to as to the desirability of reconsidering this order and rescinding its approval so far as future franchises may be concerned. Further than this, the time has come when the section of the Municipal Act permitting the granting of exclusive franchises should be repealed, or else adding a provision that all such franchises should be endorsed by a vote of the people before having any force or effect."

President Doan's Address.

In prefacing his address to the Association, Dr. Doan took occasion to congratulate the Association and independent telephone men generally on the present outlook, as follows:

"Taking all things into consideration, the independent telephone men of Canada are to be congratulated upon the success that they have won.

W. Doan, M. D.

"This success has come on so quietly and so quickly that I am in grave doubt as to whether or no the scattered and poorly-organized independent telephone forces of Canada really appreciate the advanced position which they enjoy.

"Of one thing I am certain—neither the financial circles of Canada nor the residents of the large cities have the faintest idea of the progress made by the movement or the money invested in the business. Some of them are just beginning to show signs of an awakening, and. as it were, are rubbing their eyes as if trying to gain a clearer vision. But the Bell Telephone Company comprehend—and while in one way they are keeping very quiet and trying to make it appear that they are not disturbed, still, in another way, they are indicating the greatest possible anxiety."

The address, given below in full, is a comprehensive review of the telephone situation in Canada:

"Five years ago there were scarcely any independent telephones in Canada. The Bell Telephone Company was then the whole thing. It not only owned and operated the only telephone system of any importance in the Dominion, but it owned what was at that time the only telephone manufactory in Canada, viz., that of the Northern Electric & Manufacturing Company, Limited, of Montreal, which was then, and is now, the manufacturing and supply department of the Bell Telephone Company of Canada. People who can remember that far back say that the policy of both the Bell Telephone Company of Canada and the Northern Electric & Manufacturing Company, Limited, is different now. Some go so far as to say that the Northern Electric & Manufactuirng Company, Limited, was not then advertising 'the beauties of locally owned and locally operated telephone systems,' and that they were not then out with agents trying to sell telephones to the rural communities of Canada.

Net Work of Independent Lines.

"I have been told of the struggle at Ingersoll, Ont., where the citizens finally organized an independent telephone company, and are to-day giving up-to-date central energy telephone service to over 900 subscribers, as compared to 200 subscribers served by the once arrogant Bell telephone monopoly.

"You have all heard more or less of the successful Norfolk county independent telephone movement, which had its inception in Waterford, Ont., and has developed to a point which has forced the Bell Telephone Company to abandon that field.

"If we have taken the trouble to inform ourselves, we know in a general way how the southern portion of Ontario is fast becoming a net-work of independent telephone lines outside of the more important cities.

"Lately the movement has taken hold in the northland, and crossing from Fort William and Port Arthur, which own and operate municipal telephone plants, to Cobalt and Haileybury, we find the Temiskaming Telephone Company in sole possession of the field, and looking southward we find the movement rapidly taking hold in the entire southland.

"The development in Prince Edward county has spread to the north and east, and a careful study of the territory now covered by independent telephone lines reveals the fact that by the building of a comparatively few independent connecting links these various local telephone systems could be joined together into one vast system of independent telephone lines covering the territory east from the Detroit river and Lake Huron nearly to Montreal, and from Lakes Erie and Ontario north to Lake Nipissing.

"Starting again the Province of Quebec at St. Lambert, which is just across the river south from Montreal, we find the National Independent Telephone Company with lines running to Levis, Quebec, Riviere du Loup, and on down into New Brunswick, and connecting with the independent telephone lines of Maine and the New England States.

"The facts are, and sooner or later the Canadian public will come to realize, that the independent telephone systems of Canada (not including the Government-owned telephone systems of Manitoba, Saskatchewan and Alberta), cover the Dominion of Canada much more completely and are to-day giving telephone service outside of the cities to more people in Canada than are served by the one-time telephone monopoly of this country.

Independent 'Phones in Cities.

"Already the independent telephone movement has taken hold in the cities. We have seen how the citizens of Ingersoll have outdistanced the once arrogant Bell Company. Now let us consider the development at Brantford, Ont., where the Canadian Machine Telephone Company is now operating the Lorimer system of automatic service. When that city of 20,000 inhabitants granted a franchise to the Independent Company, the Bell Telephone Company of Canada served less than 500 telephone subscribers. The Brantford service then (as it is now in many Canadian cities) consisted of an overloaded, antiquated manual switchboard of the local battery type, while the principal streets of the city were obstructed by unsightly poles and a network of wires, which the city council and mayor were unable to control. When competition came the Bell Company got busy. Down came the poles. Up went a new Bell central office building. An underground cable system took the place of the unsightly network of wires, and to-day the Bell Telephone Company boasts of and advertises Brantford and Brant county, Ont., as showing the banner telephone development in the Dominion of Canada.

"But let us see what became of the Independent Telephone Co., whose franchise forced all of this activity on the part of the Bell Company. An investigation reveals the fact that this competing company is to-day furnishing good independent telephone service to over 1,200 subscribers in Brantford and vicinity, and by interchange of traffic with neighboring independent telephone systems, it enables the subscribers of the Canadian Machine Telephone Company at Brantford to talk to more people in the territory surrounding Brantford and for less money than can the subscribers of the Bell Company.

"What has been accomplished at Brantford is now taking place at Peterboro and Lindsay, where the Bell Company has been forced by competition to tear out its local battery systems and install up-to-date telephone plants.

Ontario Government Legislation.

"Five years ago the great mass of the Canadian public looked upon the telephone as a luxury. To-day the telephone is recognized as an economy and a necessity, and the three great western provinces of Manitoba, Saskatchewan and Alberta, recognizing this, have purchased the Bell telephone lines in said provinces, and are now engaged in building telephone lines and furnishing Government telephone service to the respective residents. The wisdom of this movement has been clearly establishd. As an aid to emigration alone, the fact that the settler can obtain telephone connection with his oft-time distant neighbor and trading point has induced and enabled many a family to settle and remain upon the frontier. As an investment the telephone has proven to be one of the most economical and largest dividend-paying expenditures that a farmer can make.

"Since that time, the Ontario Government, recognizing the great benefit of telephone service to the province as well as to the locality, has enacted legislation by which the residents of any locality can by petition to its municipal council secure the provision of the necessary funds to install a local telephone system, and, recognizing the injustice of the exclusive Bell Telephone contracts sion of the Legislature passed what is known as the Charters Act above referred to, the said Ontario Government at the last ses- and thereby provided a way by which any and all local telephone systems in the province shall provide operating connections with adjoining telephone companies.

"The effect of this legislation of the Ontario Government will prove to be far-reaching and very beneficial to all locally owned and operated telephone systems regardless of whether these local systems are municipally owned or privately owned. Under the operation of this law the Bell Telephone Company of Canada can no longer enforce contracts designed to retard the independent telephone development in Ontario, and this fact was keenly recognized by the officers and attorneys of the said Bell Telephone Company when they labored so strenuously before the committee to have the authority of the Railway Board changed from 'shall issue an order' to 'may issue an order,' which would have enabled the Bell Company to have fought every application in an effort to prevent the board from granting the desired connection, thus making the proceedings so tedious and expensive that the smaller companies would be debarred from taking advantage of the Act. Independent telephone men and the public owe a debt of gratitude to the Hon. I. B. Lucas and the members of his committee for the firm stand they took in this matter.

Importance of Charters Act.

"During the past year we have tasted the first real fruit of the Canadian Independent Telephone Association in the enactment of the Ontario Telephone Act, which was introduced in the last session of the Ontario Legislature by Mr. Charters, who has publicly stated that the credit for initiating this legislation is due to Mr. Francis Dagger, secretary of the Association, and who deserves a place in the telephone history of Canada, dating from his services as Dominion Government expert of the Mulock investigation down through his services as Government expert for the provinces of Manitoba and Saskatchewan, and now as secretary of this Association and by his assistance to Mr. Charters and the Legislative Committee in the preparation and enactment of the law above referred to.

"In my opinion the benefits of the Charters Act to the many Ontario operating companies is dimly understood. You may not know it, but I am of the opinion that in addition to the many benefits the public will gain from this Act it will prove to be the means of saving to the various Ontario companies, in the aggregate, over hundreds of thousands of dollars. This law, if I rightly understand its purport, will, when fully understood and complied with, nullify the efforts of the many pernicious private contracts by which the Bell Company hoped to strangle the Independent telephone movement in Canada.

"Had it not been for the financial support (feeble as it was) given to Mr. Dagger by the Association during the past year, he could not have given the necessary time to assist in the good work, and now with the law enacted there is coming up much detail regarding its application, and this will require the constant attention of some person capable of understanding the necessities of the situation.

Time to Stand Together.

"Now is the time for the Association to jump in and be strong, now is the time for the members of the Association and for all those interested in the extension of the telephone movement in Canada to contribute liberally to the support of the organization which is prepared to reap the benefits of the victory you have won. Mark you, and mark it well, the Bell Telephone Company will try, and try hard, to nullify the effect of this Charters Act. Without the watchful care of some person capable of comprehending the full situation you may expect, at least, effort upon the part of the Bell Company, through some unsuspected agent, to introduce adverse legislation. Now is the time when every independent operating telephone company and association in Canada, no matter whether under contract with the Bell Telephone Company or not, should contribute to the support of this Canadian Independent Telephone Association, and a contribution equal in amount to five cents for every telephone owned and operated by said owners is a good safe investment in support of the movement. If this is done and done cheerfully and soon, this Association can build up a strong compact working force from which practical timely aid can be expected by every government, municipal and privately owned telephone system in the Dominion of Canada."

During the session one of the delegates prepared a table showing a comparison of independent and Bell telephones in a few districts. The table showed 4.512 independent 'phones and 629 Bells, as follows:

	Independents.		Bell.	
	Local.	Rural.	Local.	Rural.
Ingersoll	400	500	200	25
Welland	280	300	140	40
Caledon	100	162	5	3
Brussels	90	500	10	5
Harrietsville	..	320	2	2
Blenheim	87	343	61	4
Markham	88	280	45	21
Port Hope	10	360	..	..
Forest	72	233	15	..
Sombra	22	64	14	..
Wheatley	65	235	47	..
	1,214	3,298	539	100

Other Delegates Speak.

Mr. E. M. Trowern, secretary-treasurer of the Retail Merchants' Association of Canada, read a paper on "The Importance of Organization for Mutual Protection." Mr. Trowern declared that we have arrived at the crux of the situation of Governmental ownership. He urged the members of the Association to consider these questions without prejudice, and without party or politics—"the greatest curse this country or any other country ever had." He counselled those running a telephone company to run it in the best manner, and not to go around believing that the State should own it. For a fair comparison, the ability of men running a so called publicly-owned concern should be charged up to the cost of it. The business of such an association as this was to prepare fair rules for the telephone game, to see that one would not hurt another, and to see that the other fellow was not doing business at less than cost.

Mr. A. Denholm, of Blenheim, urged the need of legislation striking out the power now given to municipal corporations to grant exclusive franchises. It ought to be as easy for a company taking a wire into a Bell office to get connection with other places as for an individual person going into a booth to get one. Within five years there would be a million telephones in use in this country, and there ought to be the utmost freedom of long-distance connection.

The membership fee in the Association was changed to five cents per telephone connected with each system, and $1 for each company. The present fee is two cents per telephone and $2 per company.

New Books

Wireless Telegraph Construction for Amateurs—by A. P. Morgan, D. Van Nostrand Company, New York, publishers, price $1.50 net—a book embracing practical information for those who may wish to build for private or experimental use a set of wireless implements. Very thoroughly illustrated.

The Tesla High Frequency Coil—by Haller and Cunningham; D. Van Nostraud Company, New York, publishers; price $1.25 net. Showing how a satisfactory apparatus for producing high tension currents may be constructed, with descriptions of various uses of such apparatus. Well illustrated.

Dynamo Electric Machinery by Samuel Sheldon, Ph.D., and Erich Hausmann, E.E. D. Van Nostrand Company, New York, publishers; price, $2.50 net. A description of the best practice in construction, design and operation of direct current dynamos. Text book designed for engineering courses. Eighth edition revised and enlarged to 322 pages. Well illustrated.

Electricity Experimentally and Practically Applied, by S. W. Ashe, B.S., E.E. D. Van Nostrand Company, New York, publishers; price, $2.00 net. The subject of electricity presented from an experimental standpoint. A book for the beginner and the practical man. Carefully and fully illustrated.

Water Turbine Plant—by Jens Orten-Boving, M.I.E.E. Raithby, Lawrence & Company, Limited, publishers. This treatise has purposely been prepared partly as a text-book dealing with the modern theory design and application of water turbines and accessories, and partly as a catalogue. It is specially intended to be of practical use to those interested in complete water-power installations, and is confined to the more purely mechanical portions of such plants. The book is divided into three parts: (1) Theory and Tests; (2) Classification and Dimensions; (3) Descriptions of Various Power Stations. In the latter section short mention is made of both the Calgary plant and the city of Winnipeg municipal scheme at Point du Bois. These and all the other plants described are being supplied with machinery from works with which the author is intimately connected. The illustrations are especially fine and the general make-up very attractive.

The Telephone Company of Prince Edward Island recently received a proposition from the Maritime Telegraph & Telephone Company, of Halifax, N.S., to purchase their stock. The offer was not favorably received by the meeting called to consider it, and an adjournment was made. At the adjourned meeting it was decided not to accept the offer to purchase. The cable is now being laid between Caribow and Woods Islands by the Nova Scotia Telephone Company.

Legal Notes

Town of Sandwich v. The Sandwich, Windsor and Amherstburg Railway Company Rights of Company on Streets

The Ontario Railway and Municipal Board made an order declaring that defendants had a mere license to occupy the streets of the town of Sandwich under a by-law of said town passed February 22nd, 1873, and that the town did not grant the railway company a perpetual franchise, and had not power so to do, at the time the by-law was passed; also, that the railway was a street railway and that the agreement between the parties dated May 27th, 1891, was subject to the provisions of the Street Railway Act; and, further, that the right of the railway company to use and occupy the streets of the town expires on December 15th, 1912.

Court of Appeal held, that the appeal should be allowed with costs, and the matter be remitted to the Board for further hearing upon the matters reserved to itself when disposing of the question of construction.

Young v. Gravenhurst—Member of a Commission a Servant of the Municipality

Latchford, J., held that a member of the Waterworks and Electric Light Commission of a town, constituted by by-law passed under Municipal Light and Heat Act, R.S.O. (1897), c. 234, and Municipal Waterworks Act, R.S.O. (1897), c. 235, is a servant of the municipality, and as such was liable to examination under Con. Rule 439a.

Trade Inquiries

1096. Agents.—A London firm of electrical and mechanical engineers wishes to apopint agents at Montreal, Toronto, Halifax, Winnipeg and Vancouver.

1357. Gas and Electric Fittings.—A firm in the English midlands desires to be placed in touch with a firm on the east coast of Canada who would be prepared to represent them as sole agent for the sale of fancy gas and electric fittings.

1438. Agent.—A London firm manufacturing every description of electrical accessories, wish to appoint an agent in Oanada.

1546. Hand, steam, electric and petrol cranes, etc.—An English firm manufacturing hand, steam, electric and petrol cranes, traverses and turntables, capstans, water cranes and pumps, tanks, swing bridges, castings, contractors' and railway plant, wagons, concrete mixers, sluices for irrigation works, and refrigerating machinery, is seeking to extend their business in Canada, for which purpose a director is now visiting the Dominion.

1543. Agent.—A London correspondent wishes to get into touch with parties in Canada open to take up the sale in the Dominion of water turbines, engines, etc.

1595. Agents.—A Manchester firm of ventilating, heating and electrical engineers wishes to appoint agents to represent them in Alberta, British Columbia and the Maritime Provinces.

Dossert & Company, New York, announce that through their Canadian representative, Irving Smith, Esq., of Montreal, they have arranged with the Northern Electric & Manufacturing Company, Limited, to act as sales agents for Dossert Solderless Connectors in their several branch houses at Toronto, Winnipeg, Regina, Calgary and Vancouver.

The Western Canada Power Company are now installing two steel penstocks at Stave Falls. These penstocks are 14 feet 6 inches in diameter and designed to drive, each, one 13,000 h.p. turbine. The exciter pipes are also being installed and are 49 inches in diameter. The steel for these pipes was manufactured in Scotland, but assembled locally.

Current News

Canada Iron Corporation and Electric Power.

The Canada Iron Corporation, Limited, has just issued a descriptive booklet giving in very attractive detail a summary of its varied activities including iron mines, blast furnaces, car wheel-foundaries, pipe foundaries and machine shops. This corporation operates its works at Fort William entirely by electric power. Altogether, there are 57 motors, aggregating over 1,000 h.p. Alternating current is supplied by the Kaministiquia Power Company at 2,200 volts and transformed in the corporation's own station to 550 volts for operation of the induction motors. The direct current motors are supplied by two motor generator sets, each consisting of a 125 h.p. induction motor and a 75 k.w. generator. Blowers, air compressors, cranes, transfer cars, clay mixers, sand mixers, exhaust fans, tumbling mill, incline hoist, and fire pumps are all electrically operated.

Westbury Light and Power Company

The Westbury Electric Light & Power system, Mr. H. A. Worby, proprietor and manager, are installing a second 125 h.p. Crocker turbine water-wheel, procured from the Jenckes Machine Company, of Sherbrooke, Que., the demand having outgrown the first unit of that size. Current is generated at 3,000 volts and transmitted 2 miles to the village of Angus, and 5 miles to the town of Cookshire. The present load is chiefly for lighting purposes, there being about 1,500 16 c.p. lamps in use, with a rapidly growing demand.

110,000 Volts for Germany

It is interesting to note the praiseworthy efforts of the old world to keep pace with the rapid progress in electrical science in our own country. America boasts two 110,000 volt transmission lines, one the recently completed Grand Rapids-Muskegon system, the other our own 283 mile line in Southwestern Ontario. Word now comes from Dresden, Germany, that the Lauchhammer Iron Works of that place have awarded a contract for a 110,000-volt transmission line. The Messrs. Siemens Schuckertwerke Company, of Berlin, will construct the line.

An Electric Omnibus.

The Electrical World publishes a description of an electric omnibus operated by Edison storage batteries and capable of covering, on one charge, anywhere from fifty to seventy-five miles of country roads. The vehicle is 22 feet long and 7 feet 4 inches wide and will accommodate thirty passengers. The total weight of the car is 8,000 pounds, one-fifth of which is the weight of the batteries. The motor equipment consists of two motors of 7 h.p. each, trolley car rating. The motors are chain-connected with sprockets on the hind wheels. The car is being tried out at the Edison works at Orange, N.J.

The Canadian Tungsten Lamp Co.'s New Branch in Vancouver.

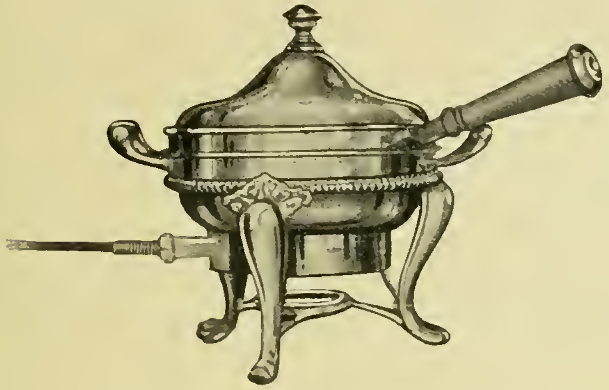
The Canadian Tungsten Lamp Company, of Hamilton, Ont., have made arrangements with the Hinton Electrical Company to represent them in British Columbia. Large stocks of the "Kolloid-Wolfram" tungsten lamps and of all kinds of "Brilliant" carbon lamps will be carried at 606 Granville St., Vancouver, and 911 Government street, Victoria. This move has been found necessary on account of the increasing demand for these lamps on the Pacific coast. Shipping as they do now, in carload lots, will also effect considerable saving to the British Columbia merchants in the item of freight and should prove a great convenience to the electrical trade.

In the United States Court of Appeals the General Electric Company recently appealed from a former adverse decision in their claim against the Allis-Chalmers Company for infringement of patents in connection with the manufacture of their polyphase transformer case. The Court finds that the charge of infringement is established by the evidence.

NEW APPARATUS

New Chafing Dish

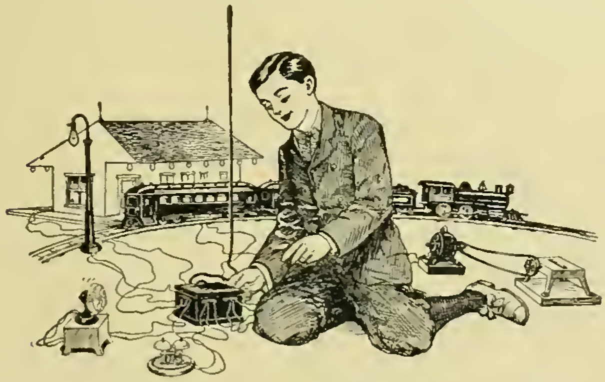
The chafing dish shown herewith is one of the latest creations of the National Electrical Heating Company, of Galt, Ont. It is made of heavy copper with brass trimmings, and has proved a popular seller wherever introduced. The National Electric Heating Company have outgrown their present premises, and have decided to move to Toronto early in the spring. They are now building a fine 4-storey factory on Queen street east which will be ready for occupation in the course of a few months. It is their intention then, to add to their lines of electrically heated devices.



Toy Transformer

The old system of using storage or dry batteries for operating toys and miniature lights was very troublesome. Dry batteries are very easily short-circuited and thereby put out of commission at once, and the majority of storage cells contain acids and other compounds, which are liable to spill and ruin clothes, carpets and rugs. No such troubles are experienced with the small transformer shown. It is designed to be connected direct to any alternating current lamp socket and does the work more satisfactorily than batteries.

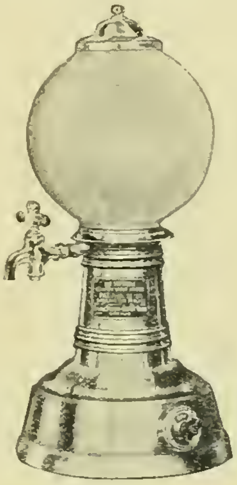
The Thordarson Transformer shown in the cut generates ten different secondary potentials, stepping down the 110 volts to ten different voltages. These voltages may be used singly or all at one time, or two or more voltages may be used at the same time. There is no danger owing to the fact that the secondary windings are entirely separate from the primary and are thoroughly insulated. Any inexperienced boy may readily use the transformer by following the instructions, becoming familiar with the different circuits in a few moments.



The transformer will operate all classes of electrical toys, such as small motors, electrical trains, bells, buzzers, electric engines, miniature lamps, etc. Another feature of this field and one that is not generally known is that all small direct current battery apparatus that does not require more than 50 watts may be operated with a toy transformer on an alternating current without any change in the windings or connections.

An Instantaneous Water Heater

The accompanying cut shows a new and useful device, recently placed on the market by the National Stamping & Electrical Works, of Chicago, in the way of a portable, instantaneous water heater. The heater is finished in nickel. It can be installed anywhere, attached to an ordinary light socket and operates on any current direct or alternating. One of the features of this heater is that a small quantity of water can be heated in less than one-half minute. The water does not come in contact with the heating elements and is discharged perfectly pure and clean.



Metric System Favored in Australia

The House of Representatives of the Commonwealth of Australia recently passed a resolution pledging the Commonwealth Government to seek the approval of the next Imperial Conference to a common decimal system of money, weight and measure throughout the Empire, and, failing this, to proceed with the consideration of such a reform in Australia and invite the co-operation of New Zealand therein. The resolution was carried by 35 votes to 2.

Still more recently the Russian Government has prepared, and will lay before the Duma, a scheme for establishing the metric system throughout that Empire.

A large party of financial and business men of Montreal and vicinity recently visited the works of the Canadian Power Company at St. Timothy, on the Beauharnois Canal. The works may be completed by March 1st next. Twelve thousand horsepower will be developed under a 50-foot head. The steel work in connection with the power house is being done by the Dominion Bridge Company. The S. Morgan Smith Company, of York, Pa., are supplying the turbines.

Mr. P. W. Sothman, chief engineer of the Hydro-Electric Commission of Ontario, was the speaker at the Electrical Section meeting of the Canadian Society of Civil Engineers, Montreal, on October 27th. Mr. Sothman spoke on the 110,000-volt transmission lines of the Hydro-Electric Commission.

Current News and Notes

Aylmer, Ont.

The Ontario Municipal Board were recently called upon to decide the question of arranging for one central office, in Aylmer, between the South Malahide Telephone Company and the Bayham & Malahide Telephone Association. At the Board's request Mr. Francis Dagger, secretary of the Canadian Independent Telephone Association, came down and acted as mediary in the negotiations, an amicable agreement being reached as a result. This is another instance of the valuable work the Ontario Telephone Act is doing.

Arnprior, Ont.

The Galetta Electric Power & Building Company and the town council are negotiating for the supply of 100 h.p. to be used for pumping purposes.

Brandon, Man.

At a special meeting of tne city council the Brandon Light & Power Company's franchise, granted by the city five years ago, was extended for another ten years, with an added clause stating that if the city, at the expiration of the time of the franchise, gave one year's notice of taking the company's plant over, and did not do so, the franchise would be extended for another five years.

It is stated that the E. B. Reese Company have acquired control of the Great Falls Power Company, and therefore now have about 250,000 horsepower at their disposal.

A large number of petitions are in circulation through the city asking that the council grant a franchise to a Vancouver syndicate for the establishment and operation of a street car system in Brandon.

Belleville, Ont.

It is stated that on January 1st the Electric Power Company will seek from the city, through the introduction of a by-law, the necessary concessions to enable them to build and operate an electric railway here.

Brockville, Ont.

At a recent meeting of the Board of Light Commissioners a resolution was adopted requesting the town council to submit a by-law to the ratepayers providing for the management of the light and water departments by one commission, consisting of five members, to be composed of the Mayor and four other commissioners elected for two years alternately. The departments at present are managed by two separate boards.

Speaking before the Canadian Club here the Hon. Clifford Sifton again emphatically declared his unchangeable opposition to the Long Sault proposition.

Berlin, Ont.

Five and one half miles of the line for the People's Railway between Berlin and New Germany have been graded, and are ready for the steel. Work is now going on between Bridgeport and Bloomingdale. Several of the piers for the 400 foot span over the Grand River have been completed and the abutments are now under construction.

Charlottetown, P.E.I.

The cable laid between Picton and Wood Islands for F. B. McCurdy & Company, Halifax, is completed. Some time ago the telephone company of this city tried the experiment of talking over the cable to Picton, and results were satisfactory. Later on talk was carried on between Charlottetown and Halifax, for several minutes. This is the first time in the history of Prince Edward Island that this has occurred.

Calgary, Alta.

The wires of the electric lighting system are gradually being placed under ground. Two miles of conduits for electric wires were laid this summer and this will be increased by a considerable mileage next year.

William Kennedy, jr., of Montreal, hydraulic engineer, has been decided upon by the power committee to investigate the power possibilities of the Bow and Elbow and other adjacent rivers for the benefit of the city of Calgary.

Coaticook, Que.

The People‘s Telephone Company have just closed a contract for a term of years at Dixville with the Tonguay Telephone Lines, whereby they are given service free over this line to their subscribers.

Duncan, B.C.

The electric light by-law was passed on the 8th inst. The electrical engineer who has been installing the electric plant in Stewart has been sent for and will begin operation. The Eaton property has been secured and a brick building will be put up. At present the electricity will be generated by steam.

Dundas, Ont.

The town of Dundas has signed a contract with the Hydro-Electric Power Commission for 600 horsepower at the same price as Hamilton, viz., $17.50. No additional transformer station will be required to supply Dundas, and the only construction necessary is a short pole line for about a mile into the town.

Dunnville, Ont.

A committee has been appointed to meet the Hydro-Electric Power Commission and private companies with a view to finding the most advantageous arrangements for light and power for this municipality.

Englehart, Ont.

It has been decided to sell debentures for $30,000, covering a period of 30 years, for the purpose of developing the power at High Falls to generate electricity for the town.

Edmonton, Alta.

In view of the action of Mr. A. Violette in seeking to estabilsh prior rights in devolopment of power on the Athabasca river which the city of Edmonton proposed to develop, Commissioner Bouillon, acting under instructions from the city council, it is stated, has taken up the matter with the Minister of the Interior, to ascertain the position of the city's claim, and to safeguard its interests.

Fort Frances, Ont.

In the Court of General Sessions, recently heard in Fort Frances, Judge Fitch presiding, judgment in the case of Isherwood vs. Ontario & Minnesota Power Company was given against the latter. The trouble arose over the blocking of the waters of Rainy river by the power company during repairs to their tail race, which resulted in inconvenience to the plaintiff's power plant lower down the river. Judgment given for $390.

Gravenhurst, Ont.

Mr. Justice Riddell awarded John Young $7,500, and his mother, $2,250 damages against the town of Gravenhurst for injuries received by the lad (17 years old) as a result of the town's defective wiring. The judgment will probably be appealed.

Guelph, Ont.

Niagara current was turned on in this city for the first time on November 6th.

It is rumored that the Robert Stewart Company will enlarge their lumber yards and factory and install Niagara power to drive their machinery.

Gretna, Man.

The town has decided to investigate the lighting of their streets by gasoline, and later on to put in an electric lighting plant.

Goderich, Ont.

The Board of Trade are in favor of the town asking the Hydro-Electric Power Commission's assistance in formulating a scheme for Maitland river power development, in case Niagara power proved too costly.

Halifax, N.S.

The steamer Lady Sybil took on board recently at Picton the spars and other outfit for the Marconi wireless station to be erected at Magdalen Islands. Mr. Taylor, who is in charge, with his men and a complete outfit for the erection of the new station, also went by the Lady Sybil, and expects to rush the work through, and have the plant in operation in a short time.

The Silliker Car Company has sold out to the Nova Scotia Car Works, Limited. Messrs. J. R. Douglas and J. R. Lamy, of Amherst, are financially interested in the latter company.

Hamilton, Ont.

The Canadian Tungsten Lamp Company's new wing on Cannon street, is nearly completed, most of the interior fittings being now in place. This makes the third wing that has been added to this progressive plant within a year. This increased accommodation provides more than one-third more floor space and with the new machinery, which is of the latest and most up-to-date character, will more than double the output. The laboratory is particularly worth a visit, being undoubtedly the best equipped laboratory to be found in a lamp factory in America.

Haileybury, Ont.

Work has been already started on the development of a hydro-electric plant on the Mattagami river at Sandy Falls in the Porcupine district, six miles from the Timmins mine. Three thousand horsepower in generators has been ordered from the Canadian Westinghouse Company, Limited, and turbines of like capacity from the S. Morgan-Smith Company, of York, Pa. This plant will be in operation by June 1st, 1911. Current will be generated at a pressure of twelve thousand volts and a frequency of twenty five cycles per second.

Inverness, Que.

The monthly meeting of the directors of the Megantic People's Telephone, held recently, showed that the work is being pushed with all possible speed. The question of having to cross the Shawinigan Power Company's line three times by following the line between Halifax and Black Lake, recently purchased from the Bell Telephone Company, was taken up. It was decided to trench at the Sheeny bridge and by making a mile and a half of a circuit to cross this power once, thereby saving expense and also securing a better system.

London, Ont.

In regard to the proposed radial line between Sarnia and this city, it is said that English capitalists have agreed to take over the whole stock and build the road, which includes branch lines to Grand Bend on Lake Huron, Strathroy, and other points. D. A. Stewart, promoter.

The London Electric Company, through its manager Mr. Chas. B. Hunt, has offered to sell out to the city on any reasonable basis of valuation. Failing a mutual agreement as to price the company offers to abide by the finding of a board of arbitration.

Progress in extensions to the London Street Railway lines have been greatly delayed by a scarcity of labor.

The London Street Railway Company have officially refused to accept the offer of the hydro-electric commission to supply them power at $31 per horsepower. The measurement of power by the peak load is unsatisfactory to them.

The Provincial Government will take legal action against the London & Port Stanley Electric Railway for operating its system on Sundays, contrary to the Ontario Railway Act and Lord Day's Act.

The city council has passed a resolution asking the provincial government to buy the business of the Bell Telephone Company in Ontario.

The announcement of the Water Commissioners of the rate for house-lighting when hydro-electric power arrives here, has been made. There is a fixed charge of 4 cents per hundred square feet floor space, basements and garrets not included, which the customer must pay no matter how much or how little electricity he uses. This is claimed to be unfair, as many consumers who burn little in the summer time, and who may be out of the city on holidays, will still have to pay. Some of the citizens have been figuring on their charges for the past year and comparing them with the price of 5 cents a kilowatt hour quoted by the London Electric Light Company as soon as the hydro-electric power is delivered in London. It is claimed that the city rates do not show up favorably by the comparison.

Listowel, Ont.

The People's Railway Company propose to run an electric line from London to Listowel, and north to Meaford.

The Fire Underwriters' Association has had an inspector in the Temiskaming district for the last couple of months.

Medicine Hat, Alta.

It is reported that the Alberta Electric Railway Company is applying to the Dominion Government for a charter to instal telephone and telegraph lines, to construct and operate light and power plants, to acquire and operate coal mines, and to construct and operate an electric railway to connect Medicine Hat, Calgary, Lethbridge, Banff and intermediate towns.

Moose Jaw, Sask.

An application is being made for an act to incorporate "The Moose Jaw Electric Railway Company," giving power to construct and operate a street railway in Moose Jaw, Sask. The company will have power also to acquire or construct suburban lines leading from the city.

Montreal, Que.

The Montreal Street Railway has announced their readiness to begin the construction of a belt line underground railway as soon as the city will give them the necessary legislation.

The Lachine, Jacques Cartier & Maisonneuve Railway Company has forwarded copies of a plan to construct a railway line in and near Montreal to the Railway Commission and to the Board of Control. The company proposes to build its line from the junction of St. Laurent avenue and Cartierville avenue, in St. Laurent parish, ending at St. Catherine street. It is intended ultimately to connect the eastern and western terminals of the system in the city. The G.T.R. proposes to build an east end station with docks and wharves.

The Public Utilities Commission has rendered its judgment following the special inquiry into the circumstances of numerous street car accidents that have occurred in the city, and for the purpose of ascertaining if it were possible to devise improved means for preventing such accidents. The Commission in its finding made several important recommendations, chief of which is that the present pattern of car fender must be taken away and replaced by a wheel guard of an approved type.

Official notices have been published in the Canada Gazette that the Grand Trunk will apply at the next session of Parliament for power to purchase the stock of the Montreal & Southern Counties Railroad, and to formally assimilate this electric line. At present the new electric road runs from Montreal across the Victoria bridge to St. Lambert and thence to Longueuil. Its charter, however, provides for rights extending in one direction to Ste. Hyacinthe and in the other to Valleyfield and Beauharnois, and it is regarded as a very valuable feeder to the Grand Trunk. The line will in all probability be continued as an electric system, but will be run in close conjunction with the Grand Trunk, for which it will make a very useful collector of business.

A short time before annexation the Notre Dame de Grace ward entered into a contract with the Saraguay Electric Company for 350 4-ampere lamps at $90 per lamp per annum. This number has been reduced by the city Board of Control, by agreement with the company, to 75, but the price has to remain the same, although this is the same lamp the Montreal Light, Heat & Power Company now furnishes for $63. Tungsten lamps, 100 c.p., are to be furnished for $35 and 50 c.p.

Montreal Street Railway uses about 300 cars ordinarily, and as many as 550 at rush hours.

On behalf of Mr. Gribble, of Montreal, a complaint has been lodged with the Public Utilities Commission against the Montreal Light, Heat and Power Company, complaining of the excessive tolls on gas and electric light, and also excessive interest on unpaid accounts. The complaint will be dealt with at the next meeting of the Commission, which will be held in December.

Ald. L. A. Lapointe has given notice of motion that a by-law be prepared which would enable the city to borrow a sum of money for local improvements, as below. He explained that the legislature had already approved of the plan, all that was needed now being the preparation of the necessary by-law. In his motion Ald. Lapointe will ask that the money be borrowed for the following purposes: For the enlargement of the water works, $1,000,000; for a filtration plant, $1,500,000; for execution of public works, $4,500,000; for a municipal lighting plant, $1,000,000; for underground conduits, $1,000,000; for working capital, $1,000,000.

The Board of Control has decided to take action through their attorneys to compel the Montreal Light, Heat and Power Company to pay taxes on their wires and poles. The tax would amount to $140,000, and the company has contested it for seven or eight years.

The Montreal city council at its last meeting awarded to the John McDougall Caledonian Iron Works Company, Limited, of Montreal, the contract for a motor-driven centrifugal pump of 5,000,000 gallons capacity, for $7,716. The unit consists of a 16-inch two-stage turbine pump driven by an Allis-Chalmers-Bullock 500 h.p. wound rotor motor. There were fifteen tenders for this unit, including the John Inglis Company, of Toronto; Canada Foundry Company, of Toronto; Chapman & Walker, of Toronto; Canadian Boving Company, of Toronto; Canadian Buffalo Forge Company, of Montreal; Nather and Platt, of Montreal, and Peacock Bros., of Montreal.

The Grand Trunk has announced that the plans of track elevation from Bonaventure station to St. Henri, which are now being prepared for submission to the Railway Commissioners, at a meeting in this city to be held shortly, embrace a scheme for the working of the traffic by electric instead of steam power.

Niagara Falls, Ont.

The system of street lighting is considered inefficient. Manager Folger has estimated the cost of a new equipment at about $9,300.

George Kamanoff has been granted $3,250, by a jury, from the Ontario Power Company for negligence. The jury also found the company negligent in giving their employees reasonable protection. In this particular case a huge lump of frozen earth was allowed to remain above where the men were working, at Niagara Falls, and while Kamanoff was working in a trench below it fell on him crushing his legs so badly that it was necessary to amputate them above the knee.

Two country roads in the district are to be lighted by electricity. They are Lundy's Lane and St. David's Ravine, two of the darkest roads in the peninsula. The contracts for the lighting have been let.

The Hydro-Electric Commission appeared here recently as a petitioner against the assessment on their lines made by this city and the township of Stamford. W. W. Pope, Secretary of the Commission, appeared before the Court of Revision, and argued the case on the ground that Crown property, or property held in trust for the Crown, is exempt from taxation under the Commission Act of 1904. He also argued that both in London and Stratford the desired exemption had been granted on the ground that the Hydro-Electric Commission is supplying power, not distributing it, that being done by the municipalities, whose lines and conduits have not been taxed in the past. The court decided that neither this city nor the township can legally collect any rates on transmission lines.

Nelson, B.C.

Two street cars have arrived from Ottawa and been placed in commission during the mouth of November. Street car service has not been operated in Nelson since the fire, 3 years ago, which destroyed the car barns and rolling stock. The new cars are of the latest design and have a seating capacity for 40 passengers.

Mr. S. S. Fowler, mining engineer, recently returned from a visit to the Queen Charlotte Islands, stated that he is satisfied that Moresby Island is practically a reservoir of low grade copper ores.

Ottawa, Ont.

The Ottawa Electric Railway Company has given the contract for building 18 new "pay-as-you-enter" cars to the Ottawa Car Company.

The Ottawa, Rideau Valley & Brockville Railway Company announces that it will begin work at once building its proposed 60-mile railway from Ottawa to Brockville. Andrew Haydon, president.

A company has been formed of which the provisional directors include R. McElroy, M.L.A., Carp; F. A. Heney, Westboro; Ald. J. S. McCann, Kingston, and E. P. McGrath, Ottawa. A charter will be asked for to construct an electric railroad between Ottawa and Kingston, passing through Smith's Falls, etc. Mr. F. B. Proctor, Trust Building, Ottawa, is the solicitor.

The St. Lawrence power question is again looming up. Henry Holgate, C.E., of Montreal, with others, have conferred with the engineers of the Railways and Public Works Department in order to once more present to them the plans of the Long Sault Development Company. Mr. Holgate states that there are no new features in the plans and that there is no proposal to alter the general scheme of leaving the whole control under the Canadian Government.

George C. Gibbons, K.C., chairman of the International Waterways Commission, has confirmed the report that that body will not deliver judgment at all upon the project of damming the Long Sault on the St. Lawrence river. "It will be a matter to be dealt with by the new commission provided for by the International Waterways Treaty," he said. The old commission took much evidence and heard a great deal of argument on the subject, but has never rendered a decision. It is expected that the new one will be appointed before the end of the year. It is probable that the personnel will include some of the old commission.

Some months ago an order-in-council was passed appointing Chairman Mabee, of the Dominion Railway Commission, as the Canadian representative on a proposed international commission to regulate freight rates on through traffic passing from Canada to the United States, or vice versa, or from points in one country to points in the same country where part of the travel is made through the other country. At present the three trunk lines of Canada pass through a portion of the United States and a large quantity of the traffic originating in the United States passes through Canada. There is a general disposition to bring such traffic rates under the control of some international commission, but this can only be done effectively by some treaty arrangement. It is possible that the proposed treaty will establish a joint commission with jurisdiction over the whole subject of international traffic, including not only freight rates, but telegraph, telephone and express rates as well.

That a foreign or other ship in Canadian water is under the jurisdiction of the Railway Commission as regards control of wireless telegraph rates is the opinion of Chairman Mabee, of the Commission.

The question of telegraph companies' liability for the proper delivery of messages came up before the Railway Commission to-day on application of various telegraph companies doing business in Canada for approval of their message forms. Heretofore the telegraph companies have held themselves liable only to the amount of tolls for the proper transmission of an ordinary despatch, and for fifty times the tolls in the case of a repeated message. The commissioners thought this too low, and suggested that there should be a maximum liability of $500. Representatives of the companies suggested that the maximum liability should be limited to $200 for ordinary messages, and to $400 for repeated messages. The board reserved its decision.

Penticton, N.B.

Mr. J. M. Robinson is endeavoring to interest English capital in an electric railway to connect the towns on the east shore of Okanagan Lake, between Naramata and Vernon.

The municipal council is about to take out records on Penticton and Ellis Creek which will be a basis for supplying the town with 1,000 horsepower for power purposes. Five hundred horsepower will be developed and a domestic water service will be installed, work upon which will be commenced shortly. Five hundred horsepower will be in reserve for development when the occasion arises. F. Latimer, the municipal engineer, estimates that sufficient power may be developed from these records to fill the electrical requirements of a town four or five times as large as Penticton now is, and at the same time enough water pressure will be available for from thirty to forty hydrants, ensuring adequate fire protection.

Paris, Ont.

Communications have been received by the mayor from the Grand Valley Railway, asking if Paris is open to purchase a large block of power. That company is about to construct a 40,000-volt transmission line through Paris, from Brantford to Galt, for its own use, as well as with the idea of selling to towns and villages on or near the right-of-way. The company also contemplate erecting a transformer house here, plans for which have already been drawn. A conference has been arranged between the officers of the company and the electric light commissioners of Paris.

Port Hope, Ont.

Col. Ward, K.C., announces that the Ontario Government Cabinet has passed an order in council granting lease of land for power sites at Burleigh Falls to the Central Ontario Power Company, the owners, and also lessees of the Dominion Government of power and also use of canal dam and works.

Port Arthur, Ont.

The Joint Board of Commissioners will ask Fort William for two more and Port Arthur for four more new cars for street railway service.

The telephone system in Port Arthur has grown at the rate of nearly two a day for the past year. With 1,700 telephones in the city, friends of the municipal ownership principle claim it to be the largest proportion relative to population of any city in Canada, with the lowest rate, at $1 a month for residence telephones and $2 for business.

Port Arthur has been suffering inconvenience owing to a scarcity of electrical power due to the current of the river running dry. The hydro-electric sub-station being constructed to take power from the Kaministiquia Power Company at Kakabeka Falls, will be ready about December 1, when the supply will meet all possible demands. In the meantime it has been necessary to resurrect the old steam plant at the Current river power house.

Phoenix, B.C.

The British Columbia Copper Company has commenced the construction of an aerial tramway from its Lone Star mine, in Washington state, to Boundary Falls, B.C., a distance of five and a half miles. The aerial system is estimated to cost $75,000. Buckets carrying about 600 lbs. of ore will be operated over the line, which will have a capacity of 20 tons per hour. The ore thus conveyed to Boundary Falls will be shipped to the company's smelter at Greenwood, a distance of four miles, via the C.P.R.

Quebec, Que.

Permission has been granted the Dorchester Electric Light Company to enter this city and carry on electric light and power distribution in opposition to existing companies.

Rouleau, Sask.

The city has voted $15,000 for electric light system.

Renfrew, Ont.

Debentures to the amount of $117,000 are being offered by the town of Renfrew, the proceeds to be used for the construction of a municipal plant and distributing system for electricity in connection with the Hydro-Electric Power Commission plant.

Fire destroyed the power house and generator of the Renfrew Electric Company recently. The town is installing a hydro-electric plant, but this will not be ready for some months.

Regina, Sask.

A by-law to expend $100,000 on a street railway system carried by a large majority.

The city is ambitious to have a "great white way" and to that end Commissioner Sheffield is getting signatures of business men on Scarth street, where it is proposed to erect a large number of large lamps. The cost to the business men is to be $1.50 a foot frontage.

Ruskin, B.C.

On November 8th the head office of the Western Canada Power Company received cable advices that the first of the big 13,000 horse power turbines had been shipped by the Escher Wyss Company, of Zurich, Switzerland.

St. John, N.B.

The New Brunswick Telephone Company will shortly open a new exchange at Stanley, with between 80 and 100 subscribers and within a short time it bids fair to be the leading country exchange in the Fredericton district. The new exchange will be conducted under the management of Mr. Stanley Ebbett, manager of the Fredericton exchange, and its establishment is unmistakable recognition of the progress of the Stanley district, one of the leading agricultural sections of the entire province. It is expected to have the new exchange in operation and all connections made by the end of November or first of December and the long distance toll rate from Fredericton will be 25 cents for 3 minutes conversation, the same as to Stanley at present.

Swift Current, Sask.

The contract for supply of installation of motors, dynamos and outside equipment for an electrical light and power plant, a gas producer and a motor and

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Advertisements in this department will be charged at the rate of 15 cents per agate line (14 agate lines make one inch) per insertion.

Advertisers who do not wish their names disclosed may use an Electrical News Box number without extra charge.

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1 Cowan and Company Corliss Engine, 13 inch x 30 inch, 70 h.p.

1 National Electric Company Alternating Dynamo, 65 k.w., 1100 volts, 125 cycles, 1450 rev. single phase, including switchboard and connections.

1 Spare Exciter for above Dynamo.

Shafting, Pillow Blocks, Pulleys, 2 Friction Clutch Pulleys, Belting, Belt Tighteners, etc.

The above Engine, Dynamo, etc., are all in good condition and can be seen running.

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Tenders for Electric Travelling Crane

Sealed tender, on prescribed forms, addressed to the Chairman of the Board of Control, Winnipeg, Canada, and marked on the envelope, "Tender for 500 k.w. Motor Generator Sets," or "Tender for Electric Travelling Crane," will be received at the office of the undersigned up to 11 a.m. on THURSDAY, DECEMBER 15, 1910.

Copy of specification and form of tender may be obtained at the office of Smith, Kerry and Chace, Carnegie Library Building, Winnipeg, Canada, or at the office of the firm in Toronto, Ontario.

Each tender must be accompanied by a certified cheque as set forth in the instructions to bidders, which cheque will become forfeit to the corporation under the conditions set forth in that document.

The city reserve the right to reject any or all tenders, or to accept any bid which shall appear advantageous to the city's interests.

M. PETERSON,
Secretary.

Office of the Board of Control.
Winnipeg, November 11th, 1910

Positions Wanted

A graduate in Electrical Engineering at McGill University, for several years engaged with a large electrical manufacturing company in United States, in their testing and engineering departments, married, wishes to engage with an electric light and power company in a small town or city, preferably in Eastern Canada, as manager and engineer. Will undertake to reduce operating expenses to a minimum, increase business, and put the plant on a good paying basis. References furnishes. Address Box 162, "Electrical News," Toronto, Ont. 12

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pump for a modern sewage disposal plant, it is stated, has been awarded to Carter-Jones Company of Fort William, Ont.

St. John, N.B.

James Kent, general manager of the C. P.R. Telegraph Company, foreshadows an extension of the company's lines along the Dominion Atlantic Railway.

Seaforth.

The Hydro-Electric by-laws submitted to the ratepayers recently authorizing council to enter into agreements with the Commission passed here and also in Mitchell. Both towns will be supplied by a 13,200 volt line from Stratford.

Stratford, Ont.

The Light & Heat Commission are considering alterations to the old electric power station. Architect Hepburn has prepared plans and tenders will be called.

Sherbrooke, Que.

Plans are being prepared by Messrs. Ross & Holgate, of Montreal, Que., for the construction of a new power house on the Magog river. The proposed plant will develop about 3,000 h.p.

The Sherbrooke Railway & Power Company has secured permission from Ascot council to erect poles for transmission of power from the plant in Sherbrooke to Capeton mines, a distance of eight miles. Other industries are now negotiating for power along the same route.

The Sherbrooke Street Railway Company have commenced operations with a large gang of men in Lennoxville, taking up the present railway track for the purpose of putting in heavier rails and new ties. Owing to a break in the dam the company found it necessary to suspend the car service for a few days throughout the city.

Toronto, Ont.

The city architect has issued to J. C. Eaton a permit for a power house to be erected on Davenport road, near Spadina road, at a cost of $5,800.

The city council, by a vote of twelve to nine, decided against the purchase of the Toronto Railway Company.

The Railway Board has suggested that the congestion of traffic on Yonge street north on the Toronto & York Radial Railway would be best relieved by double tracking. The York Township Council object, however, and will join with the council of the Town of North Toronto in opposition to the proposed scheme.

A deputation headed by J. J. Preston and J. H. Devitt, two members of the Legislature, waited upon Hon. Frank Cochrane, Minister of Lands, Forests and Mines, to ask that the Central Ontario Power Company be given a patent to 26 acres of Government lands near Burleigh Falls. This company has received from the Dominion Government a concession to develop power at Burleigh Falls on the Otonabee River, at the head of Stoney Lake. The land in question is immediately adjoining this water power. At the present time the question of ownership is in dispute between the Ontario and the Dominion Governments, and therefore the Minister of Lands, Forests and Mines is in favor of a lease. The company, however, desires patent rights. It promises cheap power to Cobourg, Port Hope, Peterboro, and surrounding towns.

The concrete poles which are being used by the city for power and light service are being manufactured at the rate of 100 a day, and the street gang is installing them at the rate of a mile a day. It has been necessary to put on a night gang in order to double the results. The present street lighting contract with the Toronto Electric Light Company terminates on December 31st.

The contract with the Interurban Electric Company, under which the streets of former West Toronto, now Ward Seven, are lighted, expired on November 1st, and on a recommendation by the civic power department and city solicitor, a new contract has been made, which can be terminated at any time by the city on giving fifteen days' notice. The company offered to supply power for the street lights at nine cents a lamp per night under a three-year contract, for 12 cents for a one-year contract, and 15 cents a lamp per night, under an indeterminate time period. The indeterminate contract at 15 cents a light per night, was accepted. This is six cents a light dearer than the nine cents charged under the present contract, but is four cents a light per night cheaper than the 19 cents a light per night charged by the Toronto Electric Light Company for lighting the city streets. A terminable contract was chosen because it is expected to light the streets with civic power in a few months.

The Bell Telephone Company, in Toronto, has filed a new schedule of rates with the Dominion Railway Commission for their approval. The new rates are $5.00 higher for both business and residence in the older city ($50-$55 for business; $30-$35 for residences), but proposes the same rate for all the recently annexed districts. This will mean a decided reduction in the latter districts, which now pay a flat rate of $30 plus $5 for every quarter mile from the nearest station, amounting in some cases to a total of $100 a year.

City Engineer Rust estimates the cost of building and equipping the proposed street car lines in the new territory at $1,118,360, which sum is made up as follows: Track work, $250,000; permanent pavements, $320,000; equipment(including two transformer stations, three car barns, forty cars, with additional sweepers, etc.), $558,360. The cost of operation is estimated at $720 a day.

By sending out requests for tariff schedules the Ontario Railway and Municipal Board has found that there are 600 telephone companies in Ontario.

Some of the cars of the Toronto and York Radial Railway Company are to be equipped with electric heaters during the winter months.

At a meeting of the Etobicoke Township Council, recently, at Islington, a resolution was adopted authorizing negotiations with the city of Toronto looking to the taking over of the Mimico Electric Railway System by the city when the company's franchise expires fifteen months hence.

Vancouver, B.C.

The plans of the local syndicate which has recently applied for a charter to build a scenic mountain railway provide for one similar to that up Mt. Tamalpais in California. Those behind the application are said to be Messrs. Macdonell & Gzowski, engineers and railway contractors; Chas. H. Allen, barrister, formerly of Winnipeg, but now of this city; Mr. Geo. M. Gibbs, former manager of the Dawson branch of the Canadian Bank of Commerce and now a local broker; and Mr. Walter. E. Graveley, of the firm of Hope, Graveley & Company, of this city. A tourist hotel and cottages would probably follow.

The British Columbia Electric Railway Company has just placed with Mr. E. M. Breed, British Columbia manager for the

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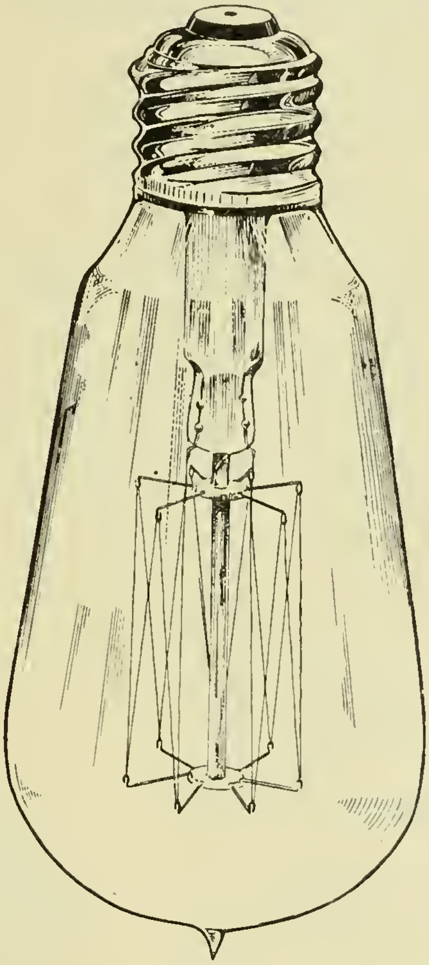

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The city ticket office of the Grand Trunk Railway System, on Granville St., is now lighted by indirect illumination, the light being reflected from the ceiling. There are no fixtures in sight and the effect is most satisfactory. The ceilings of these offices are of metal and painted pure white.

The British Columbia Electric Railway issue of 600,000 shares has been largely over-subscribed.

The B. C. E. R. will shortly inaugurate a system of electric time clocks in various portions of the city as a means of assisting conductors and motormen in adhering closely to their schedules. This system will extend to business blocks as well and to persons desirous of being connected with the wires over which the time will go every minute. The time for all clocks will be taken from a master clock placed in the head office of the company, where an illuminated dial will be placed in the corner of the proposed new building. All timepieces will be directly connected with the large clock and will be regulated at minute intervals. Besides this system the new offices of the company will be equipped with electric timepieces. The company are open to instal similar services in any business block and already have applications to equip Bauer and Metropolitan Buildings on Granville street. In Victoria a complete timing system has been adopted by the company, where many places of business, as well as the government buildings, have been supplied.

Watrous, Sask.

The National Securities Company are entering into agreement for lighting system and electric car line to Manitou lake. for Dr. O. S. Clappison, $3,500; Stewart & Witton, erection of a two-storey brick factory building 65 by 125 feet, and a dry kiln 50 by 40 feet, on Arthur street, east of Sherman avenue, for the Ludlam Ainslie Lumber Company, $12,000; Stewart & Witton, addition to factory on Mary street, corner Kelly, for Chipman-Holton Company, $5,700.

Waterloo, Ont.

The Bell Telephone Company, which installed the Central Energy System here recently, and removed the central office to Berlin, is receiving a large number of complaints of poor service.

Hydro-electric power was turned on in Waterloo for the first time on October 31.

Revelstoke, B.C.

The engineers have stated that the new plant will be in operation about December 1st.

Winnipeg, Man.

The contract for supply of 115 h.p., 60 cycle induction motor was awarded to Siemens Bros., Toronto, $330; that for drive therefor, to Jones & Glassco, Montreal, $66.11.

The board of control recommends to council the purchase of 305,000 pounds of copper wire, for use in the distribution of power about the city. Engineer Chase advised the purchase, and while some of the material will not be required for 12 months or more, the contract will be let at once.

The board of control has received a proposal from the Selkirk Light & Power Co. which now operates a steam plant. It was suggested that the city supply the company with all the power necessary for commercial and domestic purposes from the Point du Bois works. The only difficulty in connection with reaching an agreement is to be found in the transmission of power from this city to Selkirk. The local electric company has the franchise for the Main street road, but it is possible the city can secure rights over McPhillips St. and its continuation to the lake town, without purchasing a right of way. The board and the power committee will investigate.

M. Peterson, secretary Board of Control, writes that the purchase of the motor car for tramway has been deferred for the present.

The contract for the supply 5,000 pounds No. 6 waterproof copper wire, 3,000 pounds No. 8 waterproof copper wire and five miles galvanized iron wire with waterproof insulation has been awarded to E. F. Phillips Electrical Works, Winnipeg.

Hon. Wm. Ogilvie, ex-Governor of the Yukon, recently returned from a tour of inspection of the waterfalls and rapids on the Nelson river, for the Department of the Interior, is quoted as estimating the power at Grand Rapids, on the Saskatchewan, at 350,000 h.p., and three points on the Nelson River, White Mud Falls, Bladder Rapids and Manitou Rapids, at 350,000 h.p., 150,000 h.p., and 200,000 h.p. respectively.

Mayor Peltier, of Fort William, has been named as arbitrator by the street railway of Winnipeg in the approaching inquiry under the Lemieux Act into differences between the men and the company. Mayor Peltier has signified his willingness to act.

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